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The Green Thumb

VOL. 32, NO. 1

SPRING 1975



THE COVER

Entrance,
Molly Brown House

Drawing by Gene Junk

THE GREEN THUMB

SPRING, 1975

VOL. THIRTY-TWO, NUMBER ONE

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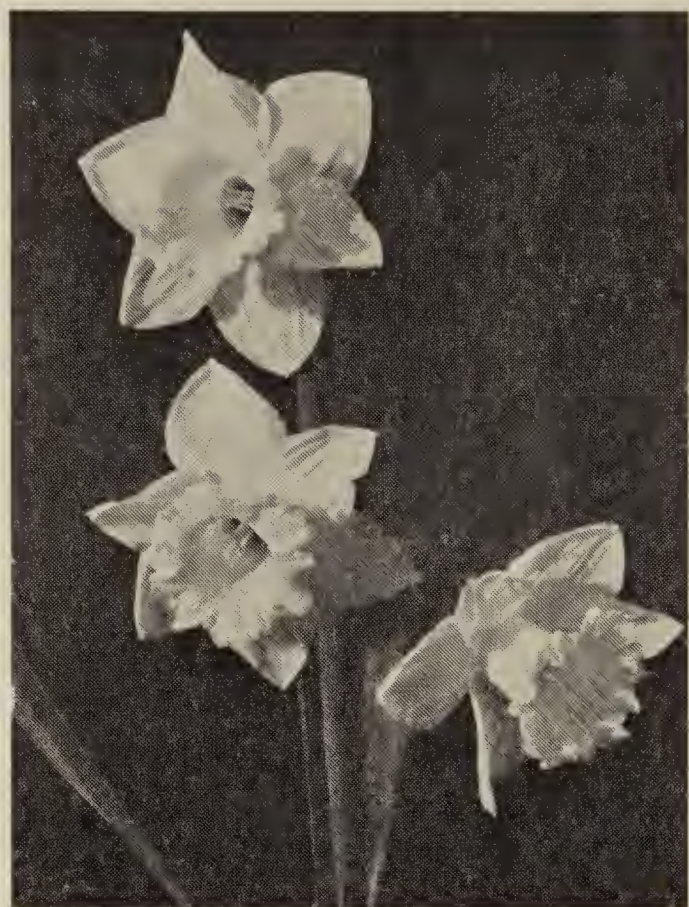
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THE DAFFODIL PLANTINGS

DENVER BOTANIC GARDENS

Harry B. Kuesel
American Daffodil Society

*"Daffodils — that come before the swallow dares,
and take the winds of March with beauty"*

— William Shakespeare

Narcissus is the correct botanical name of an entire genus for which daffodil is the popular name of considerable antiquity and acceptance. The plantings at the Botanic Gardens were made possible through donations from the Netherlands Flower-Bulb Institute and in the fall of 1973 this collection was augmented by the donation of 500 choice bulbs by Mr. Wells Knierim of Cleveland, Ohio. Mr. Knierim is a past President of the American Daffodil Society and became interested in the Botanic Gardens when he learned of its extensive rebuilding program.

Trumpet Daffodils

Outside the main parking lot steps in late March or early April, depending on the vagaries of the Colorado weather, the visitor will find a familiar large golden yellow trumpet daffodil blooming in profusion. This variety which came from Holland is called Unsurpassable and is one of the largest daffodils in cultivation.

As you enter the York Street gate to the Botanic Gardens, proceed directly west, up the steps past the Conservatory. Off to the left you will find the main planting of the daffodil display garden. Here can be found two other bright gold trumpet daffodils, Kingscourt and Slieveboy, which normally bloom a few days to a week later than Unsurpassable, and are not quite as large, but represent a distinct improvement in form. Kingscourt was originated by the late J. Lionel Richardson who lived in Waterford, Ireland, a town also famous for its manufacture of lovely cut glass crystal bowls, plates, and stemware. Kingscourt is especially noted for its very flat, velvety smooth, outer

petals, which are called the perianth, and its perfectly balanced, bell-mouthed trumpet. The blossoms are borne on tall stiff stems. It has won numerous awards in England where it has received both the Award of Merit and the First Class Certificate from the Royal Horticultural Society, and the Award of Merit from The Koninklijke Algemeene Vereeniging Voor Bloembollencultuur (Royal General Bulb Growers Society) in Haarlem, Holland. Slieveboy was originated by another Irish native, Guy L. Wilson. While not as spectacular a show flower as Kingscourt, this variety has a satin smooth texture and blooms for a longer period. Guy Wilson, who developed his daffodils at Broughshane in Northern Ireland, is famous for his white daffodils, and we are fortunate to have three of his fine white trumpets in the Botanic Gardens' display. The earliest and largest of the three is Glenshesk, which has a wax-like substance on the petals and a sturdy stem. More refined, with a broad pointed perianth and a fine, finished trumpet with a smoothly rolled flange at the mouth is Rashee. The bright yellow stamens in the center of the trumpet make this variety easily distinguishable from Glenshesk. The best show flower of the three is Vigil, an ice white trumpet with a sharply pointed, but flat, perianth of parchment like texture. This has received the coveted Award of Merit from the Royal Horticultural Society in England. Hybridizers have also developed trumpet daffodils with white perianths and yellow trumpets,



Unsurpassable – a trumpet daffodil

although we do not yet have these combinations at the Botanic Gardens. These are called bicolors, or, for the opposite color combination (yellow perianths and white trumpets), reverse bicolors. An American hybridizer, Grant Mitsch of Canby, Oregon, has developed yet another bicolor combination with a white perianth and salmon pink trumpet, called Rima.

Large-cupped Daffodils

Generally blooming several days to a week later than the trumpet daffodils, which are all in Division I, there is another large division (Division II) for large-cupped varieties. These are distinguished from the trumpets by the central crown, or cup, which is more than one-third, but less than equal to, the length of the perianth. The crown, which is sometimes called the corona, can be flat as shown in the flowers in the center of the illustration below, or erect when it has a cup shape. The Botanic Gardens collection has twenty-four varieties in Division II, which is further broken down into four major subdivisions. Division IIA — yellow perianths and bright orange to red crowns — has seven representative varieties. A good example is Paricutin by Grant Mitsch, named after one of Mexico's newest volcanoes which erupted in 1943. The large, flat, saucer-shaped crown is a fiery, luminous orange, which contrasts well with the smooth, gold perianth. Equally intense in



Green Island — a large-cupped daffodil

contrast, but with a smaller more tailored cup shaped crown, is Sun Chariot by J. Lionel Richardson. This has won the Award of Merit from both the Dutch and British horticultural societies. Others in this class are Richardson's Border Chief, Patagonia, and Vulcan; Guy Wilson's Home Fires; and Mitsch's Chemawa. Division IIB — white perianths and colored crowns — is represented by eight varieties. Daviot, originated by another Irishman who was known as "The Brodie," is a distinctive flower of exceptional charm, grace, and refinement. The clear white perianth has a hint of green shading where the petals join the crown. The orange coral crown is goblet-shaped and shades toward primrose at the rim. Another variety of very different form is Green Island by J. Lionel Richardson. The white segments of its perianth are rounded rather than pointed, and the very shallow bowl-shaped and frilled crown is greenish white at the base with a distinct band of greenish lemon at the margin. Arbar (Richardson) is a later-blooming show flower with large white petals and a bright red orange saucer. Tudor Minstrel (Richardson) is an immense white (over 5 inches across the perianth) with a smooth, large cup frilled at the mouth in deep gold. Carita, originated by the Oregon Bulb Farms, has a unique pink saucer-shaped crown on a broad, white perianth. Gossamer (Mitsch) has a reflexed white perianth and a medium crown of pale lemon topped by one-eighth inch wide band of pink at the margin. Other varieties in this grouping are My Love and Libya (Richardson), and Promise (Oregon Bulb Farms).

The third major sub-division of the large-cupped varieties (IIC) is for those flowers with both white perianths and white crowns. There are four of these in the display garden; three by Guy L. Wilson, named Arctic Doric, Ave, and Easter Moon, and one by J. L. Richardson, named Early Mist. Easter Moon has twice won the Best in Show award at the R.H.S. Daffodil Show in London, England. It has a broad, smoothly overlapping perianth of waxy texture and substance, and its cup is pure white with a cold sage green base, which sets off the bright yellow anthers in the center. Early Mist blooms early and is more like a small trumpet than the large cup-shapes typical of this class. Division IID has only one variety, Daydream by Grant Mitsch, a reverse bicolor. The lack of quantity in Division IID is compensated by quality, for Daydream is one of the finest daffodils in the entire garden. Winner of many show awards, both in the U.S.A. and abroad, it is a very perfectly-formed flower with a flat, overlapping, rich sulphur-lemon perianth, and a smooth, pale lemon crown, which fades to white shortly after opening. A white halo on the perianth around the crown enhances its beauty. This variety has also been awarded the First Class Certificate and Award of Merit of the Royal Horticultural Society.

Small-cupped Daffodils

Division III is the grouping for small-cupped varieties, in which the crown is not more than one-third the length of the perianth. This



A small-cupped variety in the foreground with trumpets in the background.

division has the same subdivisions by color arrangement as in the large-cupped division. The Botanic Gardens' collection has five varieties in IIIB for white perianths and colored crowns. Perhaps the most famous is Aircastle (Mitsch), with a perianth that opens milk-white, but soon turns to greenish-beige. The small, flat crown is pale apricot-lemon with a narrow margin of a deeper shade of apricot-lemon. This variety is a consistent winner at many daffodil shows. Another good one in this subdivision is Blarney (Richardson), which has a satin-smooth, white perianth, with a flat, orange crown and a primrose rim. It has been awarded the F.C.C. by the R.H.S. Also on display but less well known are Carnmoon (G. L. Wilson), Noweta (Mitsch), and Rockall (Richardson). Division IIIC — pure white small cups — has four representatives. Chinese White (Wilson) has a very large, overlapping perianth with a small, saucer-shaped crown with a touch of green at the center, and has won many show awards. Other varieties in this group are Wings of Song (Mitsch) and Richardson's Benediction and Engadine.

Species Hybrids

The Botanic Gardens' display garden also has two varieties which are species hybrids normally having more than one flower per stem in

bloom at the same time. The first is Rippling Waters, originated by Barr and Sons (a London nursery) in 1932. This is a very delicate variety with three or four icy white, slightly reflexed and pendant flowers with large cups. This is characteristic of the species *Narcissus triandrus*. Rippling Waters is another R.H.S. First Class Certificate winner. The other variety which is a most distinctive novelty is named Verdin (Mitsch). This is derived from the *N. jonquilla* species and has 3 small-cupped, lemon yellow flowers per stem, with the cups fading to white the second day after opening.

The Netherlands Flower-Bulb Institute recently sent two *Narcissus cyclamineus* hybrids — February Gold and Peeping Tom for testing. These are both small-flowered, golden yellow trumpets with strongly reflexed perianths typical of the parent species.

We hope this fine collection will broaden the interest of Denver Botanic Gardens members and visitors to the wonderful world of daffodils. Through the careful selection of early, midseason, and late varieties, it is possible to have daffodils in bloom from 4 to 6 weeks in the spring before most of our deciduous trees and shrubs begin to regain their leaves and flowers. A bibliography of daffodil publications is listed below for those who wish to learn more about this fine harbinger of spring.

*"I wandered lonely as a cloud
that floats on high o'er vales and hills,
when all at once I saw a crowd,
a host of golden daffodils"*

— William Wordsworth

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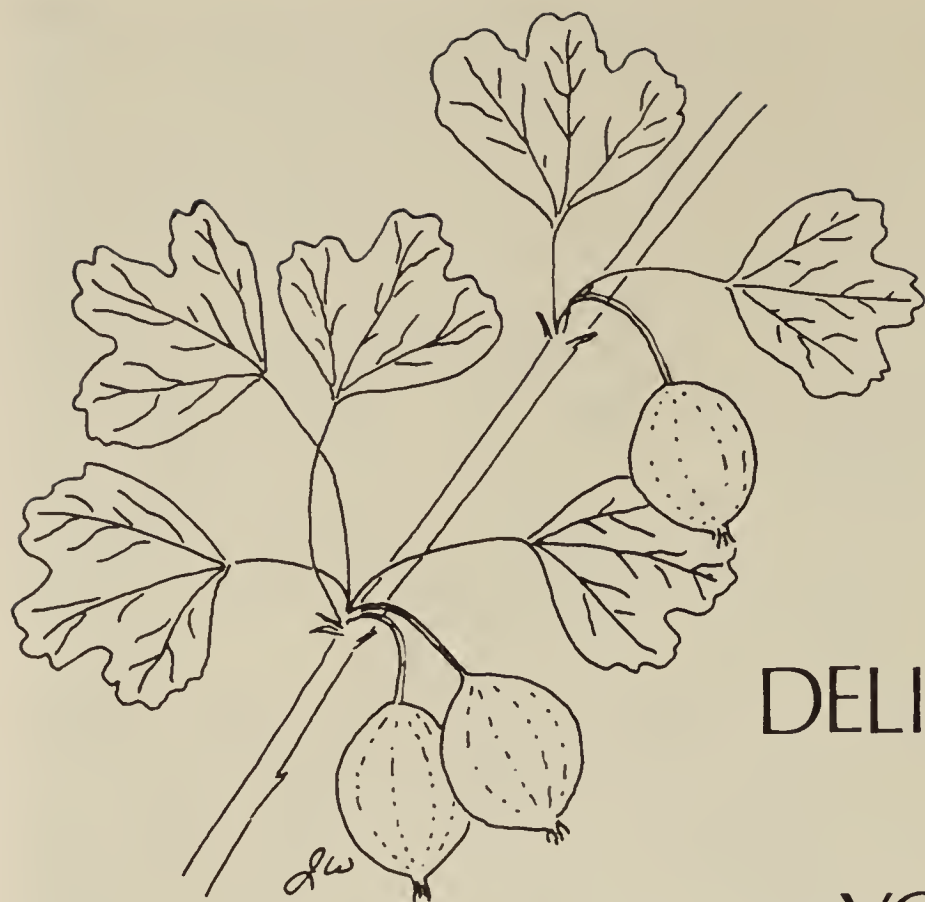
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- Gray, Alex. *Miniature Daffodils*. Forest Hills, N.Y.: Transatlantic Arts, 1961.
Jefferson-Brown, M. J. *The Daffodil, Its History, Varieties, and Cultivation*. London, England: Faber and Faber Ltd., 1969.
Lee, George S., Editor. *The Daffodil Handbook*. Mt. Vernon, Va.: American Horticultural Society, 1966.
Quinn, Carey E. *Daffodils, Outdoors and In*. New York: Hearthside Press, 1959.

Most of these publications can be obtained from George S. Lee, Executive Director, American Daffodil Society, 89 Chichester Rd., New Canaan, Connecticut 06840.

Periodicals

- The American Daffodil Society*. Quarterly Journals 1958-1975. (Membership, \$7.50 per year, address above.)
The Royal Horticultural Society, Tulip and Daffodil Yearbooks. (Obtainable through the American Daffodil Society.)



Gooseberries

DELICIOUS BERRIES FROM YOUR GARDEN

Herbert C. Gundell
C.S.U. Extension Director, Denver

Growing your own berries can be among the most rewarding of all backyard gardening experiences. The sight of any ripening berry is a promise of delicious enjoyment that really sparkles our sensory activities. Even when berry plants aren't bearing, they make excellent ornamentals such as gooseberries or currants in their spring or fall colors. Everbearing strawberries, which are widely adaptable, can even be good border plants at the edge of a flower garden. Currants and gooseberries provide early leaves and bloom and dependability that defies the elements. If berries can reward your efforts, then homegrown tastiness can do miracles for your palate. You can sometimes buy berries when they are in season, but they never taste as good as the ones you have raised yourself.

Even strawberries, which commercial growers have marketed now almost year around and to perfection, are much sweeter and tastier when they come from your own garden than from the grocer's. Besides, some of the finest eating, such as red raspberries in the fall season, can rarely be purchased. You can't quite compare the fun and joy to any other garden activity. Surprisingly most berries do not even require a great deal of space. Any corner location in the garden along a fence or a small landscaping gap lends itself nicely to bush berry plantings such as currant or gooseberry. Even for raspberries, not a great deal of space is required. Don't be too pessimistic, however, for raspberries have a well-known tendency to exceed their assigned space limitation. I have been digging

raspberry shoots up out of the rose garden for several years now and will probably continue to do so *ad infinitum*, but that isn't all bad either. After all, I should give thought to all my friends and neighbors who have benefited from this thriving production of underground shoots that the raspberry plants are putting forth every year. And I shouldn't forget that the initial three plants we started with were a gift from a friend whose legacy I am now dividing amongst many others. Oh yes, the gooseberry bush in our backyard has never failed us, even in some of the most difficult winters and freezes we have experienced in recent years. In 1969, when hardly a cherry put forth a blossom, the gooseberries were right there strong as ever, and the yield was amazing that summer. Name any year in which fruits of various types had a difficult time to survive or produce, and the gooseberries have been rewarding nonetheless. And the same is true with currants, even though they are not as productive as the gooseberry in a general sense. To make my point, I have picked as much as 16 to 18 quarts of gooseberries from a single bush and my good wife, Naomi, who prepares the berries for pie fillings and then freezes them, has contributed valiantly to our midwinter enjoyment of some delicious pies.

Now let me discuss briefly the various options you have in berry growing in your backyard and point out some of the conditions that you must satisfy to have the success that you are truly entitled to. Strawberries are among the tastier but more difficult of garden berries. The most important thing that many home gardeners do not fully realize is that strawberries require what I call "super soil." In other words, any given garden location is not at all ready to produce strawberries abundantly. To succeed with strawberries, I suggest that the location where they are to be set out be prepared at least six months to a year in advance. This can best be achieved by including with the soil large quantities of humus-

forming organic materials such as compost, leaves, and well-aged manure. The soil itself should be spaded to a depth of 12 inches at least twice in the process of soil preparation. Inclusion of superphosphate at the rate of one pound for every 50 square feet will also enhance the production of berries when the plants get going well. Needless to say, the entire locale where the strawberries are to be set out should have exceptionally good moisture drainage and should enjoy the protection of a hedge or a solid fence, or some other interference to the raw winds from the northwest. Also important when you are ready to plant strawberries is getting plants from a disease-free source. Here I would be a bit discriminating and order plants from a well established nursery, even out of state, for the proper variety. The gift plants from friends' or neighbors' gardens may be perfectly all right, but they may also have the rudiments of disease which would doom our project to very minimal production. One other thing is important to know. Strawberry plants should not be kept productive in the garden more than two full seasons. After the second, or possible third year, they usually fall off noticeably on productivity and should be replaced by starting a new bed with runner plants from our successful strawberry beginnings.



Strawberries



Red Raspberries

Among varieties that I would recommend for gardeners in this area, my first choice is Ogallala. This is followed by other varieties such as Ozark Beauty, Superfection, Radiance, and Arapahoe. Ogallala, Radiance, and Arapahoe are the results of crossing commercial strawberries with the native strawberries of the Rocky Mountains on a project which Dr. Hildreth, the former Director of the Denver Botanic Gardens, and Dr. Powers, a geneticist and research scientist, worked for a number of years. Both were then active at the Cheyenne Horticultural Field Station (now High Plains Grasslands Research Station) at Cheyenne, Wyoming. The three named varieties were the final choice after substantial evaluation of more than 10,000 seedlings that were grown from the crosses made by these two horticultural scientists.

Among the brambles, red raspberries are indeed the only important one worthy of consideration. They have the hardiness necessary, particularly in the

eastern Colorado locations, that promises long-time productivity from the garden. When it comes to making the choice between single crop and everbearing varieties, I would emphatically cast my vote for the latter. The opportunity here is most desirable because poor wintering will produce a very light summer crop, often followed by a very good fall crop of everbearing raspberries. The fall crop of everbearing raspberries depends somewhat on the length of the season. Last year, for instance, it was excellent, because of the length of the season which extended into the end of October and early November. I recall picking more than a quart of raspberries during the last few days of October after we returned from a trip and convention to the southwest. And these late berries were very sweet and as delicious as anything we had picked during the summer or fall season. Raspberries are very tolerant of soil conditions. Western alkalinity doesn't seem to bother them. They do require moderately good drainage and are often satisfied from overflow run-off irrigation water that comes from another portion of the garden. The best variety today, in my estimation, is September followed closely by Indian Summer and Fall Red. I would not recommend June-bearing varieties for backyard garden purposes for reasons I have already mentioned. Some new



Currants

varieties have come into the picture that might be interesting. Amethyst is a new purple and Fall Gold a new golden colored everbearing variety.

Currants and gooseberries are already solidly established as one of my prime choices for berry gardening in this region. Among the currants I can recommend Red Lake, Perfection, and Wilder. Gooseberry varieties include Welcome, Champion, and Pixwell. Gooseberries and currants produce most of their fruit on one-year-old shoots and spurs. They must be pruned severely after production is complete to give rise to another good year of productivity.

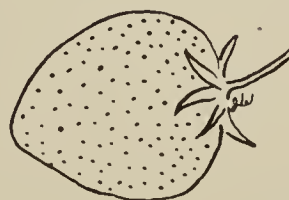
Grapes are certainly also considered among the berries of the backyard. Extensive testing by experimenters of Colorado State University has indicated that there is considerable interest in increasing the adaptability of varieties to our Rocky Mountain region. For the average backyard gardener, Concord still holds the best opportunity for year-to-year success. Concord is a very hardy variety and matures early enough to escape the early freezes of many fall seasons successfully. Other proven varieties over the years include the hardy Beta, also Niagara, Fredonia, Brighton, and Caco. Numerous other varieties are now under testing by the Colorado State University Experiment Station. Even some commercial vineyards are now under test on the Western Slope of Colorado. With grape culture, pruning is perhaps the most important criterion for success. There is a vast difference whether you grow your grapes for the protection afforded by an arbor, or strictly for production of fruit. In the latter case, it is not unusual to prune a plant 60 to 75 percent to maintain good grape production. There are three types of canes recognized on grapes: the very thin water sprouts, the very heavy and long bull canes, and the intermediate fruiting canes. After removal of all the water sprouts and most of the bull canes, only the fruiting wood remains. We then have



Grapes

to reduce each plant to not more than 80 buds. This would leave only 8 to 10 fruiting canes for each plant. Naturally everything is quite different if you wish to create an arbor where you can enjoy shade and comfort during the summer season. With an arbor, fruit production is of secondary consideration and we accept graciously what grapes we get each year.

It appears reasonable that in the next few years, availability of berries at any price will be infrequent at the market. For this reason alone, you will be gratified with the production a few vacant spots in your garden can bless you with each year.



BOOKS FOR THE IDENTIFICATION OF COLORADO WILDFLOWERS

Helen Marsh Zeiner

Anyone interested in learning to identify Colorado wildflowers is fortunate that there is available a selection of helpful books ranging from elementary to very technical. No matter what your degree of interest or of training, there should be at least one book to fit your needs. The following list of books useful in identifying Colorado wildflowers is arranged in approximate order of simplicity, with the most elementary first:

Pesman, M. Walter. *Meet the Natives*. Denver: Denver Botanic Gardens, Inc., 1967.

Meet the Natives is a very good book for the amateur. It is easy to use, well illustrated, and a convenient size to carry in the field. Plants are arranged first according to altitude and then on color-coded pages within each altitudinal zone. To use the book, turn first to the appropriate section for the altitude where the flower grew, then to the page corresponding to the color of the flower. One must then read the descriptions to determine the identity of the flower. To confirm the identification, check further in a more technical book.

Clements, Frederic E. and Clements, Edith S. *Rocky Mountain Flowers*. New York: The H. W. Wilson Company, 1928.

This is an older popular-style book which has been reprinted. It has simple, easy to use keys and excellent colored pictures which are very helpful. Many of the botanical names are obsolete, but to the amateur interested in common names this is of no importance.

Nelson, Ruth Ashton. *Handbook of Rocky Mountain Plants*. Tucson: Dale Stuart King, 1969.

Good for the beginner and useful to the advanced student as well, *Handbook of Rocky Mountain Plants* has excellent descriptions with line drawings and simple keys. It is not meant to be a comprehensive book and does not include some common plants. There is a section of information of a general nature which is both interesting and informative.

Weber, Wm. A. *Rocky Mountain Flora*. Boulder: Colorado Associated University Press, 1972.

Weber's flora is an excellent field manual, especially for the Front Range. It has very good keys not too difficult for the beginner to use. It has some black and white line drawings which are good. Because it is a field manual, descriptions are very short or lacking and it may be necessary to refer to other books for descriptions to be sure that the identification is correct.

Harrington, H. D. *Manual of the Plants of Colorado*. Denver: Sage Books, 1954.

This is the most comprehensive book available for the identification of Colorado plants. It is very detailed and complete, covering the entire state. It is a technical book not easy for an amateur to use except with help from the glossary. For anyone familiar with botanical terms it has excellent keys and very accurate descriptions. Harrington's manual is a large book not easy to carry in the field. It is often good to use a small, easily carried manual in the field for approximate identification which can later be checked and verified in Harrington.

Other publications useful to the student of wildflowers include:

Harrington, H. D. and Durrell, L. W. *How to Identify Plants*. Denver: Sage Books, 1957.

How to Identify Plants is an illustrated glossary of terms necessary in the identification of plants. Anyone not familiar with botanical terms will find it helpful.

Roberts, Harold and Roberts, Rhoda. *Colorado Wild Flowers*. Museum Pictorial No. 8. Denver: Denver Museum of Natural History, 1959.

and

Roberts, Rhoda and Nelson, Ruth. *Mountain Wildflowers of Colorado*. Museum Pictorial No. 13. Denver: Denver Museum of Natural History, 1957.

Both of these modestly priced museum pictorials are worth having for their beautiful color photographs and good descriptions of a limited number of common wildflowers.



Calochortus gunnisonii
Mariposa-Lily

Willard, Bettie E. and Harris, Chester O. *Alpine Wildflowers of Rocky Mountain National Park*. Estes Park: Rocky Mountain Nature Association, 1963.

This inexpensive publication has small colored photographs to help the amateur identify common plants found above timberline.

Thornton, Bruce J., Harrington, Harold D., and Zimdahl, Robert L. *Weeds of Colorado*. Bulletin 514-S. Fort Collins: Colorado State University Agricultural Experiment Station, 1974.

Good line drawings will be very helpful to those who wish to identify the common weedy plants of Colorado.

Note: Books on trees and shrubs were not included in this list.

BOOK REVIEW

Stephens, Rockwell R. *One Man's Forest*. Brattleboro, Vermont: Stephen Greene Press, 1974, 159 pp., \$4.50.

Rockwell Stephens has written a little book that is a useful primer for an amateur forester, a true life adventure of a retired couple starting a new life in the country, a guide to practical geology, and something that at times becomes a poem. It's called *One Man's Forest*, subtitled "Pleasure and Profit from your Own Woods".

In their sixties, Stephens and his wife "retired" to a place of about one hundred acres of woodland in central Vermont with no intentions of becoming foresters. But they found the land in need of attention and consulted their county forester for advice. Through him and their neighbors and their own continuing experiences, they've learned much, some of which Stephens passes on to us. Their approach all along was aesthetic and ecological, while at the same time they sought some profit from their labors. For example, when they felled a tree it was usually cleaned up immediately: trimmed, saleable timber cut into appropriate sized logs, the remainder sawed into firewood lengths, and all the remaining

small branches and brush cut up and scattered over the forest floor to return to the soil. But occasionally when there seemed a need for it they let the treetop lie for the use of the forest wildlife. Always they gave thought to the natural inhabitants of their woodlot: birds, mice, foxes and deer. And always they gave thought to the beauty of the landscape, their original reason for moving there to live.

At the same time, Stephens' book fills a need which he found when he and his wife began their adventure; that is, he has provided a practical, concise, and detailed guide for the layman interested in realizing some profit from his trees. Covered are techniques for felling, bucking, and skidding timber; tools and machines and their care; planting and pruning; all aspects of firewood cutting, splitting, and seasoning, as well as a careful discussion of how to evaluate and sell the merchandise. One drawback for local readers will be that the trees discussed are Vermont varieties and not those commonly found in the woods of Colorado. Still, there is much that is useful for Coloradans in this easily read little book.

Caroline Tabor

A Garden for Molly Brown

A Victorian Garden Restoration

*by Grounds Restoration Committee
Molly Brown House,
Historic Denver, Inc.*

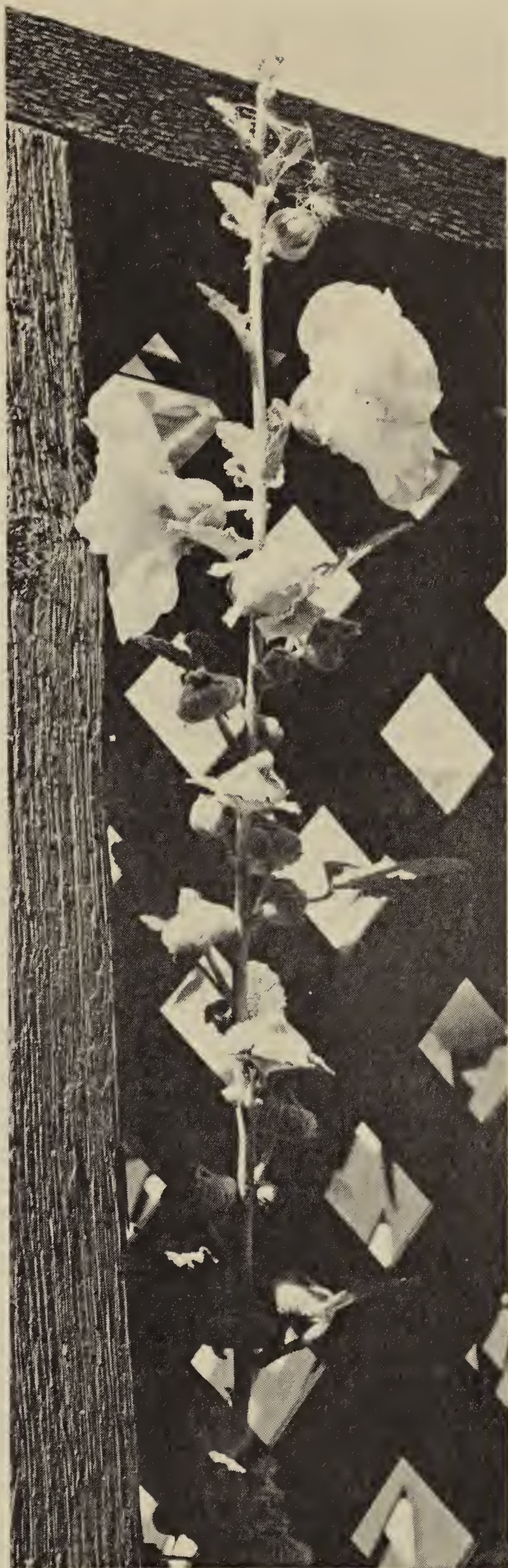


Photo: Don D. Etter

Hollyhocks and lattice fences were often found in Denver back yards at the turn of the century.

Margaret Tobin Brown's heroic efforts on board the doomed vessel, the Titanic, in 1912, as well as her flair for a unique life style, earned for this early Denver folk-heroine the title of "Unsinkable." We know much about her enthusiasms, eccentricities, and ambitions, but many of the facts are lost in legend.

In 1971 the newly founded Historic Denver, Inc. purchased Molly's house on Pennsylvania St. and saved it from destruction. Historic Denver acquired not only the residence but also the legend of "The Unsinkable Molly Brown," promoted by journalists, Hollywood, and Mrs. Brown herself. Painstaking research has been an effective tool in revealing fascinating information pertinent to the house and garden, its occupants, and early Denver.

Restoration plans were begun as soon as the residence was firmly in the hands of Historic Denver. Rather than simply redecorate with Victorian tastes and traditions, adding modern touches when convenient, and applying labels and placards to indicate origin of furnishings as is done in many museums, Historic Denver decided to restore the house as accurately as possible to its appearance between 1890 and 1910, the period of Molly's heyday. By this authentic restoration, Historic Denver hopes to generate a deeper interest in historic preservation. When touring the house, visitors should feel that they have just stepped backward in time.

Designing the grounds was an important part of recreating the era of 1910 and firm guidelines of authenticity were given to the Grounds Restoration Committee at its first meeting in June, 1972. The committee's objective is authentic restoration within

the limits imposed by other goals, financial responsibilities and varied activities of Historic Denver, Inc., a non-profit organization.

The Grounds Restoration Committee is small and landscape architects, arborists, and horticulturists are called upon for specific help and consultation. Contacts made with Jane Silverstein Reis, landscape architect; Dr. James Feucht, C.S.U.; Steve Driftmeier, Wilmore Nurseries; and Mrs. W. E. Perschbacher, the Eugene Field House of Park People, have been rewarding experiences resulting in invaluable assistance.

The challenge of restoring Molly's garden was an exciting one and the condition of the grounds gave hope. Outlines of the flower borders were intact, existing trees and shrubs were seemingly healthy and, though time-worn, the overall appearance was one of neatness. With the encouragement of the Molly Brown House Committee, in charge of policies and procedures and to which the Grounds Restoration Committee was responsible, rudimentary planning was begun.

The Grounds Restoration Committee considered the people who would visit the Molly Brown House and how the garden might affect them. The garden should be authentic and should not constrict the visitor or intrude on his total enjoyment. We wanted to create pleasant vistas from within the house, cooling shade and inviting visitor walkways. We decided to begin with major tree and shrub plantings. A scale drawing of the property, noting architectural details of the house we wished to highlight and those we wished to minimize, served as a guide for these



This 1910 photograph of Molly Brown's house was used to identify period plantings in the front yard.

plantings. Thanks to immediate and generous donations to our fledgling Tree Fund silver maples were planted in September of that first year. That choice and subsequent choices were made using the guideline of historic authenticity.

How did we know what was historically accurate? Historic Denver benefitted enormously from Molly's proliferous photo file in which she had many beautiful photographs of the interior and exterior of the house. These photos are a preservationist's dream, giving us thorough documentation of her home. Many individuals on the Botanic Gardens staff used the photos for clues to identify plant materials, following the same research procedure used to determine details for the interior of the house.

Unfortunately, Molly did not leave photos of her back yard, so other research was necessary. After searching through newspaper accounts and conducting oral interviews, we could still only conjecture about her garden. After carefully considering Molly's unique personality and other gardens of the period, we concluded we must plant an exuberant late Victorian garden. We used general information as well as the recollections of friends and visitors to the house, and our own memories of relatives' gardens. We felt fortunate indeed to discover the cooperative lending program available to Botanic Gardens through the Massachusetts Horticultural Society, where we obtained *The Victorian Flower Garden* written by Geoffrey Taylor and published in 1952. Victorian gardening history and detailed descriptions of plant materials are covered in the book. The author discusses the various styles of

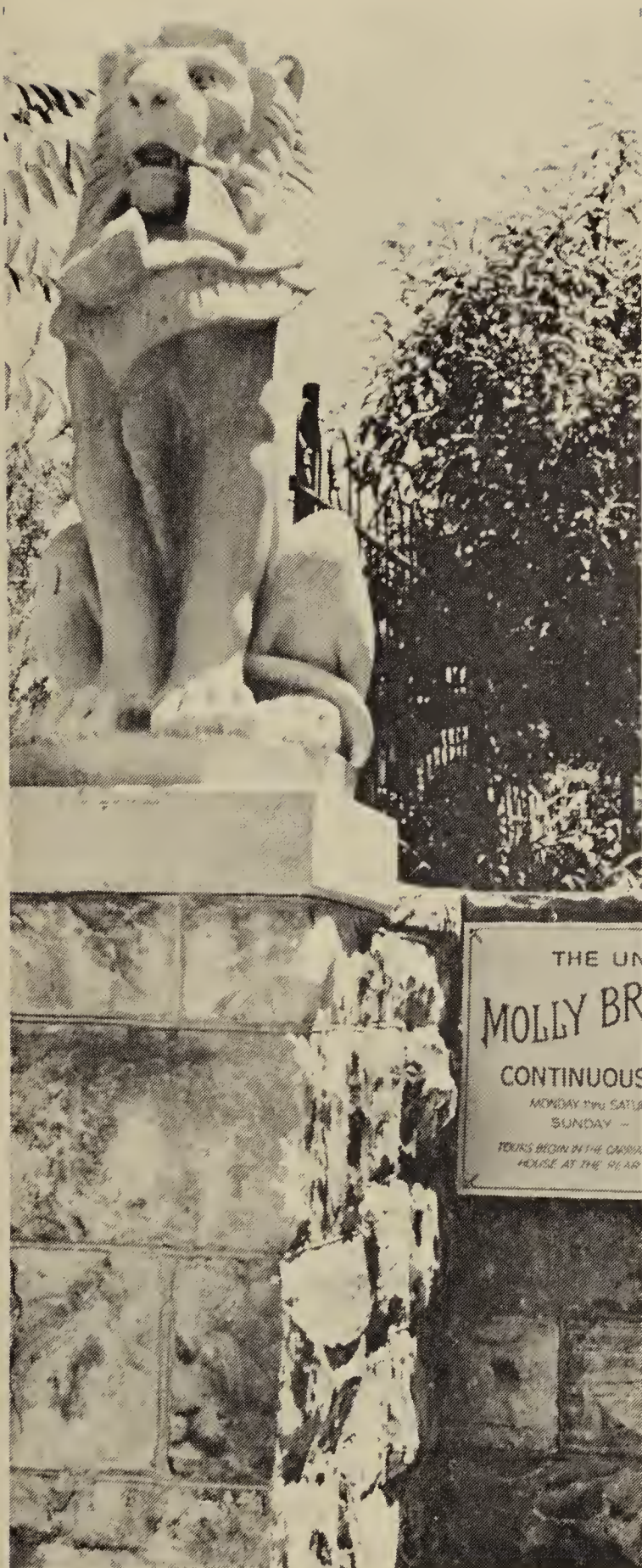
Philip Miller, William Robinson, and the color coordination theories and planting guides of Gertrude Jekyll, which served as the foundation for our applied practices.

Two of the most helpful finds from the Botanic Gardens library were seed and flower catalogs: an 1888 Breck and a 1906 Burpee. We presumed that varieties of flowers available by catalog to Denverites at those dates could safely be used in our re-creation.

When planning our first historically correct border, we knew Comanche petunias were out of the question and assumed dwarf brown and yellow marigolds were also. We happily found French marigolds quite properly listed in our well-thumbed catalogs. For a light, airy effect, we wanted to plant honey locusts along the north property line. Authentically, we should have planted *Gleditsia triacanthos*, complete with thousands of pods and thorns long enough to impale small children, but chose in their place horse chestnuts as described by Andrew Jackson Downing, a Victorian landscape gardener.

In 1973 Historic Denver hired Joan Thill as its first professional curator for the Molly Brown House. With her background in historic restoration she provides a constant flow of ideas as well as communication with the rest of the Historic Denver structure. By the time our first spring planting period arrived we felt we had sufficient knowledge to move confidently to permanent plantings.

The shrubbery and trees included snowball, lilac, cottonwood, green ash, spirea, and pussy willow. A row of tamarisk provided lacy texture contrast to the flower border while screening the apart-

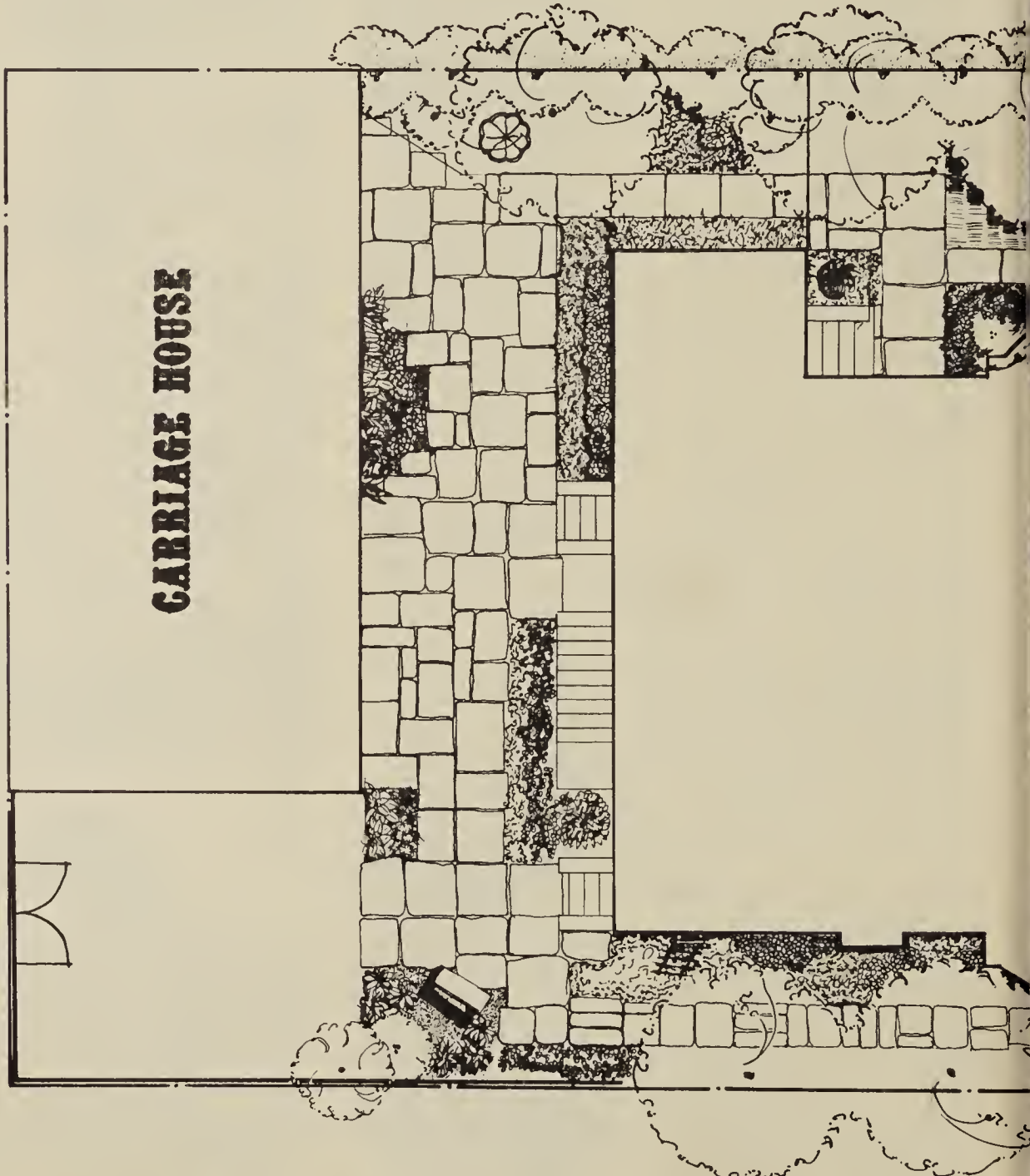


Sculpture, stonework, iron fencing and trees complement the entrance to Molly Brown's yard.



A typical narrow north yard features a sandstone walk, myrtle, violets, and day lilies.

CARRIAGE HOUSE



PLANT LIST

Trees and Shrubs

Acer saccharinum — Silver Maple
Aesculus hippocastanum — Horse Chestnut
Crataegus mollis — Downy Hawthorn
Fraxinus pennsylvanica lanceolata — Green Ash
Malus sp. — Flowering Crabapple
Populus sargentii — Cottonwood
Philadelphus coronarius — Mock Orange
Spiraea sp. — Spirea
Syringa vulgaris — Common Lilac
Tamarix hispida — Tamarisk
Viburnum opulus — European Cranberry

Flowers

Achillea millefolium — Yarrow
Aegopodium podagraria — Bishop's Weed
Althaea rosea — Hollyhock
Aquilegia sp. — Columbine
Campanula medium — Canterbury Bells
Chrysanthemum maximum — Daisy
Chrysanthemum sp. — Chrysanthemum
Clematis dioscoreifolia — White Clematis
Convallaria majalis — Lily-of-the-Valley
Coreopsis sp. — Coreopsis
Cortaderia selloana — Pampas Grass
Crocus vernus — Crocus
Delphinium ajacis — Larkspur
Delphinium grandiflorum — Delphinium
Dianthus barbatus — Sweet William
Dianthus gratianopolitanus — Pinks
Dicentra eximia — Bleeding Heart
Fragaria sp. — Strawberry
Gypsophila paniculata — Baby's Breath
Hedera helix — English Ivy
Hemerocallis sp. — Day Lily
Iris sp. — Iris
Kniphofia sp. — Red Hot Poker

Matthiola incana — Stocks
Mirabilis jalapa — Four o'Clocks
Molucella laevis — Bells of Ireland
Muscari botryoides — Grape Hyacinth
Myosotis scorpioides — Forget-me-not
Narcissus sp. — Daffodil
Nigella damascena — Love-in-a-Mist
Paeonia sp. — Peony
Papaver orientale — Oriental Poppy
Parthenocissus quinquefolia — Virginia Creeper
Phalaris sp. — Ribbon Grass
Phlox drummondii — Purple Phlox
Polypodium sp. — Fern
Primula sp. — Primrose
Rosa harisonii — Harison's Yellow Rose
Rudbeckia laciniata hortensis — Goldenglow
Salix discolor — Pussy Willow
Sempervivum tectorum — Hen and Chicks
Stachys olympica — Lamb's Ear
Viola cornuta — Johnny Jump-up
Vinca minor — Periwinkle

SCALE IN FEET



RESIDENCE OF
MR. & MRS. J. J. BROWN
 1340 PENNSYLVANIA ST. DENVER, COLORADO



ment building to the south. All of these materials were purchased with donated funds at generous discounts from local nurseries. That first year, the flower beds were not historically accurate but were designed to provide colorful accents and cutting material for the Flower Committee to use in interior arrangements. This gave us time to do additional research.

We kept in mind all those details pertinent to planning your own garden—drainage, soil preparation, climate, plant materials, height, color harmony, and drift planting techniques. By the second summer, we sent out calls for needed plants and seeds. Friends of Historic Denver were quick to respond to our pleas with boxes, sacks and car trunks filled with old favorites—hens and chicks, phlox, shasta daisies, pennyroyal, golden glow, and last but not least, the ubiquitous hollyhock. These generous individuals often lingered to offer pertinent suggestions and even helped plant.

Molly's photos show an abundance of hanging baskets on the front porch and their replacement adds immensely to the "greening" of Pennsylvania Street. Though some skeptics warned of potential theft or vandalism, we planned our restoration assuming that things of beauty would be enjoyed and respected by all, which has proved to be the case.

Our pleasure comes not only from seeing living things grow and beautify, but also from knowing we have provided pleasure for others. To our amusement and consternation, the spring bulbs have provided delicious tidbits for the neighborhood squirrels. We fondly recall one

conversation with an elderly gentleman, who, upon seeing the spring garden, reminisced with us about his mother's "pinies" which always bloomed for Decoration Day. At peony time this spring, the early varieties will bloom again in Molly's garden.

Aware of the guests who wait in the garden and knowing Victorian taste for ornate furnishings, we added garden accessories, including a garden bench, urns, a nostalgic rain barrel, and a gracefully designed bird bath. The Victorian cast iron fountain, while not visible in Molly's photos, will be left in place until a permanent home can be found for it, perhaps in one of Historic Denver's other projects.

Our major challenge was the removal of a two to four inch thick asphalt pad left over from boarding house days. It covered the entire north yard extending the full length of the property and spreading its grimy tentacles into the lovely flagstone courtyard between the house and carriage house. The resourceful curator and innumerable volunteers wielded sledge hammers and thanks to their determined help, earth was once again visible. Bleeding heart, lily of the valley, columbine, violets, and periwinkle now line an attractive flagstone path. Since this path is the route guiding visitors to the carriage house to purchase tickets, it needs to be enticing and attractive so a screen of some sort was required to shield the view of adjoining parking areas. We decided that a lattice fence would be appropriate at the rear of the property, and after thorough research a well-proportioned fence of that period was



Photo: Joan Thill

Historic Denver volunteers participate in building an authentic lattice screen for Molly Brown's back yard.

located at 1702 Platte Street. Photos were taken, a scale drawing made, and thanks to more volunteers and professional assistance from a local fence company, our screen was soon in place. A small piece of old fencing painted dark green was found in the basement furnace room. A color match was made and with due respect to Tom Sawyer, a motorized sprayer was used to paint the multi-surfaced wooden lath.

Other Historic Denver committees contributed to the improved exterior appearance of the house by removing the rickety fire escape and dismantling the incongruous television antenna. Fresh paint matching an original sample found under the eaves was applied to the abundant trim.

A prolonged growing season in 1974 gave us the time and opportunity to analyze what had grown well, to make necessary replacements, and to focus on jobs yet to be completed. We are currently developing a maintenance calendar to keep the grounds presentable. Indoor plants are also under the jurisdiction of the Grounds Restoration Committee, but have received little attention because of adverse temperature and light conditions in the house. We hope this problem can be corrected soon.

Our list of perennials needed for this summer has become more extensive and our "want-ads" in the Historic Denver *Newsletter* will appear again this spring. A hitching post and carriage step must be located and, woe of woes, the crab grass must be dealt with.

We have only begun to appreciate the information that careful historic archeology can provide for authentic restoration. When we begin peeling back addition-

al layers of asphalt in the remaining parking area in order to plant, who knows what scrap of wood, smashed pottery, or crumbled foundation will reveal itself, giving us clues and answers to questions concerning that portion of the property.

This area presents some intriguing possibilities. Should we add old-time, neck-binding clotheslines, a compost heap, and the two-story brick chicken coop which poultry-fancier J. J. Brown is purported to have had?

There is a lot to be done, but Molly's garden is almost restored. We are pleased to be invited to share the knowledge we have gained with the readers of the *Green Thumb* and in turn, we invite you to visit Molly's garden and share your thoughts about it with us. In a genuine friendship garden one shares cuttings and seeds as readily as suggestions and criticisms. We hope you will come for a visit.

The Molly Brown House, located at 1340 Pennsylvania Street, is open for continuous guided tours from 10:00 A.M. until 4:00 P.M. Monday through Saturday, and Sundays from 12:00 noon until 4:00 P.M. except between Labor Day and Memorial Day, when the house is closed on Mondays. Well-informed, colorfully costumed volunteer guides provide detailed information concerning the Browns and early-day Denver.

We hope your visit proves enjoyable and educational. This preservation project, like others of Historic Denver, Inc., is for people, and we sincerely hope it is only the first of many happy steps backward in time, with a clear eye to the future, for both you and ourselves.



Photo: Don D. Etter

A 19th century iron fence, a reproduction bird bath and period plantings enhance Molly Brown's back yard.

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* Except as noted, all titles are available at the Denver Botanic Gardens Library which, through inter-library loan, can obtain titles which it does not have.

Grounds Restoration Committee,
Molly Brown House
Margaret Sikes, Denver Botanic Gardens
Ed Shull, Landscape Architect
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Janet Fine, House Plant Specialist
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GARDENING WITH GROUNDCOVERS

Barbara Hyde
C.S.U. Extension Agent, Horticulture

Choose a groundcover as you would pieces of a jigsaw puzzle. Instead of preparing the soil to fit the needs of a plant, make do with the spot you have and search out the plant that will not only withstand the soil and exposure situation but actually prosper. Continue the jigsaw juggle by making that selection perform double duty in creating a color, texture, or form for the finished picture of your landscape.

This is how it works: suppose you have a dry, rocky hillside facing north. Dry shade is a combination that is hard to cope with, but nature has provided an astonishing number of plants that will thrive **ONLY** in dry shade, as well as others that will tolerate the hardship situation. This doesn't mean that a planting will survive with only natural precipitation, but almost. Once established, a slow soaking every ten days during hot weather will suffice.

For the city property where neighboring homes and trees are the origin of the shade, start with the low-growing shrub St. Johnswort (*Hypericum calycinum*) a plant with soft glaucous foliage and profuse butter yellow blooms in June, and a lesser display through the summer. It spreads by underground runners and can be relied upon to withstand our neutral to alkaline soil. During some years of sub-zero temperatures with no snow cover, it may be killed to the ground, but will come back from the roots in spring. Add a drift of peacock blue with dwarf anchusa (*Brunnera macrophylla*), which blooms at daffodil time, making it an ideal plant to combine with naturalized

bulb plantings. A cool mat of green and white will complete the scene, using the variegated form of wintercreeper (*Euonymus fortunei*).

Same scene, second alternative: the Colorado native shrub thimbleberry, also called boulder raspberry (*Rubus deliciosus*), has a graceful, arching habit and grows well in dry shade. The single, white, rose-like blooms are long lasting in shade, and the soft, dark red fruits are quickly snatched by birds. Carpet the scene with gray or blue-gray forms of creeping juniper, such as *Juniperus horizontalis* 'Bar Harbor' or 'Blue Rug'.

For the country property with a wide, windswept expanse of dry, north-facing slope, it would be wise to group pines in threes or fives across the slope as a windbreak. Choose the pine native to



Thimbleberry

your latitude and altitude (ponderosa, lodgepole, pinon) or the non-native Austrian pine (*Pinus nigra*) that adapts well in many areas. Add a shrub such as the native bluestem willow that bends, rather than breaks, in the wind. One usually associates willows with high water requirements, and this holds true for bluestem, but only during April and May, which is normally a period of high precipitation in Colorado. The tiny gray velvet catkins appear before the leaves on the deep blue winter stems. Another native, rockspirea (*Holodiscus dumosus*), succeeds under the same conditions and will erupt into a cloud of pale pink panicles in July. Have you ever seen this native attempted under city conditions? It rewards "cultivation" with rank, ungainly, blossom-less growth!

Suppose the requirements are reversed, from the most difficult to the most favorable, and now examine the possibilities for the owner of a gentle slope of sandy loam in full sun. The list is almost endless.

Once again, take the city garden first and mention the mosaic of a four-season display. Planning is the key to blending the colors, textures, and forms that are available. For example, the creeping phlox (*Phlox subulata*) in shades of pink, blue, or white is a delightful spring display. The bright buttercup yellow of *Potentilla abruscula* provides an early summer bloom. This is a lower, more refined form of our native cinquefoil. The blue leadwort, also called plumbago (*Ceratostigma plumbaginoides*), provides a late summer bloom and is followed by red autumn foliage. Add a cooling contrast with *Artemisia* 'Silver Mound', but take a few minutes to shear off its flower buds when they appear to preserve its neat appearance. For winter interest, the unbeatable Andorra juniper (*Juniperus horizontalis plumosa*) feathers out in shades of gold and lavender, impervious to winter sunscald that plagues other forms.

For the country property with this

fortunate exposure, there is the possibility of planting a thicket-of-three. The shrubby Sargent crabapple (*Malus sargentii*) with its twiggy habit and ultimate height of 6 - 8 feet has blooms of pale pink, followed by red fruits. This flowering crabapple will bloom at the same time the silvery new leaves of the native silverberry unfurl. Silverberry (*Eleagnus commutata*) is a member of the same family as the Russian olive tree that is an escapee from cultivation in Colorado and now considered wild. The broadleaf evergreen creeping hollygrape (*Mahonia repens*) will serve for winter color and, though a few leaves may sunscald during a sunny February, the open location will reward you with yellow blooms in spring, followed by blue fruits in late summer.

Now let's change the jigsaw a notch to the less fortunate situation of a steep, sunny slope of heavy clay. The much-maligned clay particle is still the business end of a soil, containing all the nutrients necessary for plant growth, but lacking air and organic matter. While this heavy soil holds water and cuts down on irrigation time, it can also become a greasy goo, which presents conditions for dangerous slippage on a slope. Therefore, you must search for plants that can withstand the lack of organic matter and air, and at the same time put down strong, widespread roots that can hold the hill against the swelling and heaving of winter's freeze and thaw. Such a plant is smooth sumac (*Rhus glabra*). Its growth will vary with the amount of water it receives (3 - 15 feet), and the red autumn foliage and contorted winter silhouette topped with red seed heads gives a grotesque beauty. Another sumac, *Rhus trilobata*, will perform the same hill-holding task, also with red autumn foliage, and it has an added bonus of yellow bloom in June followed by clusters of red berries that are attractive to birds. This sumac can take tremendous heat, especially radiated heat, so think of lemonade sumac (so called because pioneers brewed a lemony drink from its

berries) when you have a steep slope near a black asphalt or concrete drive.

Another change in the notches of our jigsaw brings us to the moist spot in full sun. In the city garden this might be the result of a sinking utility excavation, or, more happily, a naturally occurring change or grade that, nonetheless, makes lawn irrigation water collect in one spot. Don't fight it; fill it with a grouping of dwarf Arctic bluewillow (*Salix purpurea nana*), a rounded, smaller version of the native bluestem willow mentioned earlier. If a large area is involved, such as a ravine on country property, take advantage of the moist site by planting Colorado blue spruce. Many native Coloradoans are not aware that another common name for *Picea pungens* is water spruce, not a misnomer when we consider its preferred streamside or northslope habitat. A foreground of Colorado red osier dogwood (*Cornus sericea*, formerly *C. stolonifera*) is a combination we never tire of. The red winter stems of the dogwood against the blue of the spruce, even during a snowless period, makes a truly Colorado picture.

If the spot is alkaline (a condition that often accompanies poorly drained soils), the native buffaloberry (*Shepherdia argentea*) is a good choice. It's dark, thorned stems are stout and its leaves are silvery, like other members of the Russian olive (oleaster) family. The blooms on

female shrubs are followed by orange-red berries which are puckery-sour, but edible.

Moist shade is a situation usually found on the north side of the house in the city garden. *Pachysandra* 'Silveredge', once thought to be suitable only for acidic soils of the eastern U.S., has made its way west, and is successful in a reasonably well-drained soil. The green and white variegated foliage brightens and cools, as well as adds a five-parted leaf texture to this usually bleak area.

Sometimes on soils long neglected on the north side of older homes can be found a humus-rich, acid soil that will support European wild ginger (*Asarum europaeum*). The glossy, evergreen, heart-shaped leaves are borne erect on woody stems that spread slowly by creeping rootstocks. Let your soil test kit be your guide, for this plant is the ultimate in elegance for groundcover.

Moist shade on country property is a site easily dealt with by planting the native alder (*Alnus tenuifolia*) which is commonly found as the understory of our forest. It has rich, dark green, sharp-toothed leaves, and its pistillate catkins mature into curious little cones prized for miniature Christmas decorations. The smooth, gray bark and multiple trunks add to its desirability. The hosta or plantain lilies can add a bold texture to the ground level of this picture.



Creeping Hollygrape and prostrate Swiss Mountain Pine



Andorra Juniper, Bar Harbor Juniper, and Buffaloberry

For special situations, consider foliage texture and what it can do for you. Too often a landscape picture can be marred by the wrong choice of foliage texture.

A flight of steep steps can be a wearying prospect for the person standing at the bottom and looking up in contemplation of a long, hard climb. By using a groundcover such as *Bergenia cordifolia* on either side of the adjoining slope, the distance is made to SEEM shorter. *Bergenia* has a striking appearance, with large, dark green, leathery leaves resembling those of a water-lily, which stand erect, or at interesting angles, to reveal the showy red underside. The red color is another factor that makes the distance seem shorter, for red has a visual weight that lessens distance. The pink flower spikes are nothing to rave over, but they add a springtime note to the planting.

The foreground of a beautiful view requires a carpet of green that will make your eyes glide right over without noticing it. Turf, of course, is the ideal answer, but in situations where turf is difficult, use a plant with small foliage in plain green with no startling shape or color that would distract from the panorama. For sun, a mat of creeping juniper is a good choice, as is the native kinnikinnick (*Arctostaphylos uva-ursi*), although the latter is a slow-starter and succeeds best on a gravelly slope. For sun or shade, periwinkle (*Vinca minor*) or *Ajuga reptans* may provide the needed

cover. True, they are perhaps used too often in this area, but they have their place where familiarity makes them inconspicuous.

To create a barrier to unwanted entry into your property by man or beast, there is nothing better than a tangle of thorns. The shrub roses fill the bill (*Rosa rugosa harrisonii*, or Austrian Briar) with tough, hardy canes that are attractive in leaf, in bloom, or as red winter stems, but are deadly armed barriers against traffic of all but the birds. The same is true for a trailing rose (*Rosa wichuraiana* 'Max Graf') that is ideal for steep banks or berms, in either sun or part shade. This plant is best planted in deeply prepared holes in a flat place at the top of the bank, where it will put out long stems ("long" means 12 - 18 feet) trailing over the edge of the bank or berm. In windy areas these trailers will whip about unless they are secured by pegging them down at intervals. Instead of pegs, use u-shaped metal tent stakes that are sold by wilderness outfitter shops, and the plants will take root at the peg point. They bloom in a sheet of pink in late May, but their chief value lies with their hill-holding, barrier qualities.

Within our gardens there may be points where we can use a plant to warn our guests of danger. In Japan, plants with bluish foliage or flowers are used to denote danger, supposedly meaning that one is about to step off into the sky. It is doubtful that a westerner's subconscious

would absorb this subtle message, therefore we use more hackneyed methods to signal danger. This doesn't mean that you must surround the lily pool with a cactus patch, but a gray foliaged plant will attract attention. In other areas the spiky texture of *Yucca glauca* can be a warning, or red-leaf barberry (*Berberis thunbergii atropurpurea*) can provide the color of danger (red in this country) as well as enough thorns to deter the unwary away from a sharp change in grade.

Boulders are an asset if they are placed in groups and properly seated by placing at least one-third their volume underground so that they give the appearance of a natural outcropping rather than one of having been shoved off the back of a truck in straight-line intervals an hour ago. The raw, stark look of boulders can be softened by a planting that drapes over the rocks, casting shadow patterns and providing texture contrast. The rockspray cotoneaster (*Cotoneaster horizontalis* or *C. apiculata*) is valuable for tracery of twigs, fan-like branching habit, and bright red winter berries. They are especially at home among boulders, for the rocks protect their roots from the occasional winter temperature that drops below their hardiness range.

Pioneering with crownvetch has been a venture for public parks, industrial, and highway sites, and, after the assessment is complete, it is probable that crownvetch should remain a groundcover recommended for these sites only, and not for the homeowner. The attributes of this highly publicized plant include its bloom and ability to flourish on slopes, preventing soil erosion with virtually no maintenance. The plant also acts to "swallow up" litter which disappears into

its dense structure. Though not as easy to establish in the west as in the east, it does prosper and spread if given copious amounts of water during its first year. The winter picture of frowsy, brown stems seems to be alleviated if the planting is mowed to a 12-inch height after leaf drop in the fall. Initial enthusiasm for this plant has been high, but let caution be the watchword, lest we unleash a monster like kudzu vine in the south or Hall's honeysuckle in the north.

Maintenance of a groundcover should be kept at a minimum, but it is not implied that there is no maintenance. Until establishment is complete, hand-weeding is still necessary, but uprooting, rather than removal, serves a better purpose. Unless they have set seed, pull those weeds and do what every gardener longs to do — shove them underneath and out of sight so that what comes out of the soil is returned to it. Leaf-raking can also be eliminated. Keep the classic cartoon of WWII in mind — GI Joe "policing the grounds" with a rake handle with a nail at the end. This tool was not suitable for attacking the rubble of Bastogne, but it's still a dandy device for spearing the blown-in trash, paper, and plastic.

The choices for groundcover will become even more diverse as individual gardeners and institutions continue to experiment. The main objective is to choose the plant to fit the site conditions instead of trying to grow grass where grass doesn't want to grow, or trying to grow the beloved plant from back home in Pennsylvania (or wherever). Colorado and the mountain west are noted for their quality of life. Is there a groundcover than can improve YOUR quality of life?

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FOCUS on

Olea europaea

in the

Boettcher Memorial

Conservatory

Peg Hayward

The origin of the cultivated olive, *Olea europaea* L., may never be known exactly. It may have come from the semi-arid coasts of Mediterranean Europe or from Asia Minor. Olives were being grown even before our earliest history was written. Archaeologists have evidence of olive orchards existing on Crete in 3,500 B.C., and believe that Semitic peoples have been raising olives for at least 5,000 years. In modern times the common olive has been widely dispersed by colonists in America, Australia, and South Africa.

The genus *Olea* includes about 20 species of evergreen trees and shrubs but only the common olive, *O. europaea*, provides edible fruit. In fact, there is not another species in the *Oleaceae* family which produces edible fruit although there are in the family such well known ornamentals as forsythia, lilac, and jasmine.

Olive trees live longer than any other cultivated fruit trees, with the exception of the mango. The ancient trees growing in the Garden of Gethsemane today are considered to be well over 1,000 years old.

The attractive appearance of the olive tree has been admired for ages. Old trees frequently have gnarled, twisted, irregularly shaped trunks which are often hollow. The common olive is up to 30 feet high with a distinctive grey sinuous bark. Its rounded head bears numerous

branches which give it a thick bushy appearance. The leathery leaves are oblong lance-shaped, up to 3 inches long, ashy green above, and densely covered with silvery scales on the under side. Creamy white, fragrant flowers appear in early summer. They are borne in erect clusters; the calyx is cup-shaped with 4 teeth and the corolla has 4 spreading lobes. Many of the flowers are imperfect and cannot produce fruit. They give off much pollen and generally the wind carries the pollen from flower to flower so the tree can fertilize its flowers with its own pollen. The fruit is an oval-shaped drupe. The ripe shining purple-black fruits are very attractive. However, the idea of eating fresh fruits off the tree does not hold true for olives, because the olive, green or ripe, is bitter and utterly distasteful in the natural state.

The state of maturity at which the olives are harvested depends upon the use that is to be made of them. For making the ordinary pickled olive, the fruits are picked when they have reached full size but while still green in color. If ripe pickled olives are to be made, the fruit is left on the tree until it is black. In either case the fruit is picked by hand to avoid bruising. This is true even when the fruit is to be pressed for oil. The fruit is graded for pickles, cleaned, the bitterness removed by lye, and the process completed by hardening and preserving in salt.

The olive is a valuable tree from which oil is obtained. Both seed and flesh contain much oil, which makes up 15 to 30 per cent of the weight of the fresh fruit. The finest and most highly prized oil is made from olives gathered just before they begin to soften. Immediate extraction gives the best oil, but the water content of the fresh fruit makes it difficult to handle, so the fruit is usually partially dried before pressing. Then the pits and flesh are crushed to break the cells that contain the oil. Next, the "pomace" is formed into blocks. These blocks are piled one upon another and a gentle pressure starts the oil flowing. The first pressure gives the best quality oil and by the third pressing only inferior oil is obtained.

Olive trees will thrive in a wide variety of soils, but will not tolerate poor drainage. Crops are in proportion to the fertility of the soil. The tree has extraordinary powers of growing where the climate is very hot and dry; but for bearing good fruit, it needs a moderate supply of water. To fruit satisfactorily the olive requires a chilling period during the winter. There are only a few places in the United States which can support the olive industry such as the interior valleys and southern part of California and the Salt River Valley of Arizona.

A tree so remarkable and lovely as the olive should not be grown solely for the fruits, but also for its symbolism of joy, happiness, and peace.

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Olea europaea



FLOWERING TREES, Look Beyond The Crabapples

E. Alan Rollinger
Landscape Designer

This is the first of two articles dealing with trees in home landscaping by Mr. E. Alan Rollinger. In his work as a landscape designer, he has spent many years studying the trees used in Denver landscaping.

When selecting flowering trees for home landscaping, the ultimate size, form, flowering time, and seasonal interest should be considered. The flowering periods are fairly short for most species, so the plant chosen should also offer interest in the other seasons of the year. An example is the Washington hawthorn which flowers in the spring, is interesting in form and foliage throughout the summer, has good orange to red color in the fall, and holds its attractive red fruit most of the winter, thus providing interest throughout the year.

The hawthorns are overlooked as a group of trees which have potential for Colorado's Front Range. Unfortunately, the most popular hawthorn in recent years, Paul's scarlet hawthorn (*Crataegus oxyacantha paulii*), has proven to be one of the poorest for our climate, and in my opinion not worth planting in most situations. Its popularity arose from the fact that some consider its red flowers more attractive than white.

The largest and one of the hardiest of

the hawthorns is the downy hawthorn (*Crataegus mollis*). The flowers are white, one inch in diameter, and appear about mid-May. From a distance, and in the correct light, the flowers seem to hang suspended in the air, creating a delicate and beautiful effect. Interesting bark and a craggy "character" form at maturity make the downy hawthorn a fine choice where there is room for this large spreading tree to grow.

Well represented in the Denver area is the Washington hawthorn (*Crataegus phaenopyrum*). Its habit of growth is broadly columnar and dense. The flowers are white, about one-half inch in diameter, and appear in many-flowered clusters in June. Like most hawthorns, its fruit is bright red and persists into winter adding color to the landscape.

The cockspur hawthorn (*Crataegus crus-galli*) also grows in this area. This is a rangy tree with wide spreading branches and attractive foliage. Leaves are dense and lustrous, and in the fall turn orange to scarlet (most hawthorns have good fall

color). Its white flowers appear in late May to early June.

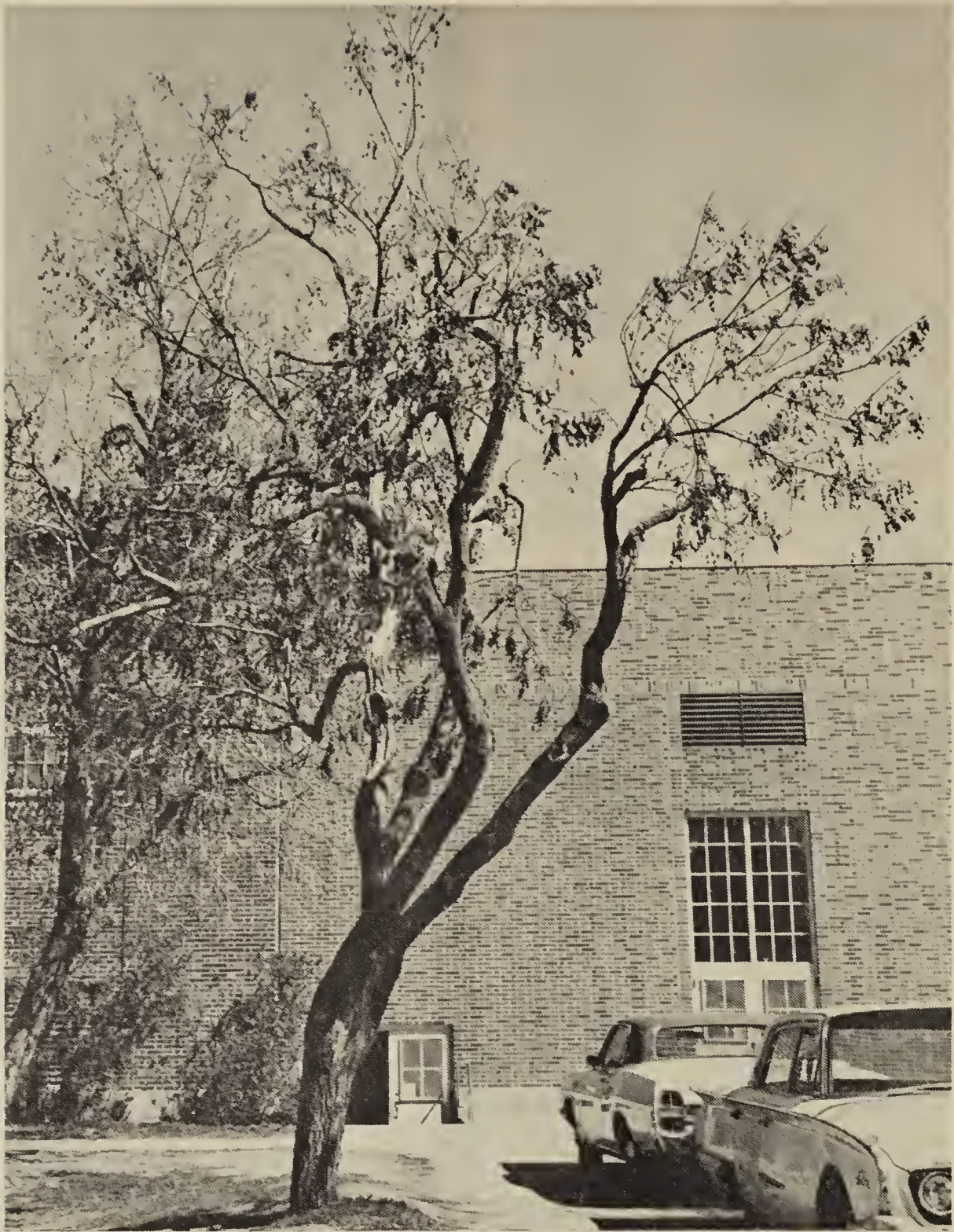
Among the hawthorns there are other species and selections with potential in our area. Arnold hawthorn (*Crataegus arnoldiana*), a columnar tree with large leaves, and winter king hawthorn (*Crataegus viridis* 'Winter King'), a spreading tree with persistent fruit which is quite showy in winter, are both being tried. From the Cheyenne Horticultural Field Station (now High Plains Grassland Research Station) comes *Crataegus ambigua*, an excellent hawthorn bearing brilliant red fruit.

Golden-rain tree (*Koelreuteria paniculata*) is a summer-flowering tree,

making it quite valuable because the flowers are not subject to late freezes, if for no other reason. Small, yellow flowers appear in large, upright, pyramidal clusters in late June or early to mid-July. Usually they appear at this time, but I have observed that time of flowering actually varies in golden-rain tree from late June to September. The early blooming tree is the most desirable, because this individual has time to set fruit and mature as the season draws to a close. A tree blooming later would tend to grow later in the year and be in danger of early freezes in the fall. It would be best to propagate from those trees proven to bloom early in our area for use here.



Downy Hawthorn



Golden-Rain Tree

Flowers are followed by persistent pod-like fruits which give the golden-rain tree another of its names, the Japanese lantern tree.

Another ornamental tree is eastern redbud. Redbud has a natural range from Wisconsin to Florida, but seed from a native tree in Tennessee does not produce a plant as hardy as seed from Wisconsin. For this reason it is difficult for the person wishing to purchase a redbud to know if he has the hardiest redbud available. The nurseryman rarely knows the origin of the seeds that produced the redbuds shipped to him. I prefer redbuds field grown in Colorado. A few Colorado winters will usually weed out the weak-

lings, leaving trees more suited in our climate.

Redbud produces small, purplish-pink, pea-like flower clusters, appearing before and along with the newly emerging leaves. Flowering usually begins in early May and is longer than most crabapples. Large, heart-shaped leaves turning a golden yellow in fall help make this an attractive plant in all seasons.

The secret to growing redbuds is selecting the proper location. Being an understory plant, the redbud grows best with some protection. Located on an east side of a home or building affords protection from driving winter winds. Being shade tolerant, the redbud also

does well on north exposures. Of course, there are exceptions, and a number of fine redbuds grow in Denver in quite exposed locations.

Newport plum (*Prunus blireiana* 'Newport') has been planted extensively in this region, probably as much for its reddish purple foliage as for its flowers. Light pink, double flowers appear in May before the new leaves. The native wild plum or American plum (*Prunus americana*), while not readily assuming a tree form and preferring to grow in thicket-like masses, can be pruned into a tree and will make an attractive specimen. Its white flowers are wonderfully fragrant.

The lesser known European bird cherry (*Prunus padus*) has been planted to a limited extent here and is certainly worthy of wider use. European bird cherry can be grown as a specimen, but it is also very effective when mass-planted in groupings. In May the small white flowers occur in drooping racemes, three to six inches long. The flowers are similar to chokecherry (*Prunus virginiana*) which can also be used as a tree and the Shubert chokecherry (*Prunus virginiana* 'Shubert') is often sold in this area.

Any discussion of flowering trees should include a few words about Japanese tree lilac (*Syringa amurensis*

japonica). Likely to fool the casual observer with its shiny cherry-like bark, the tree lilac is represented in the Denver area by specimens with trunk calipers up to 24 inches. Growth habit is pyramidal, rather open, and the leaves are larger than those of common lilac. The flowers occur in June and individual blossoms are small, creamy white, and cluster into large pyramidal heads up to six inches long.

Flowering crabapples have been omitted in this discussion for two reasons. There are so many species and selections available that they are a subject in themselves, and I also think that we have gone a bit overboard planting crabapples at the expense of other species of flowering trees.

What is a tree? A common sense definition is that a tree is a plant you walk under and a shrub is a plant you walk around. Many of our common shrubs grow to 15 feet or more and if properly trimmed become as much a tree as any flowering crabapple. Several examples are some of the large forms of *Viburnum* and honeysuckles. This habit of classifying plants into categories of trees versus shrubs is an arbitrary system, and not a natural one. So, being excluded from this article does not mean a plant could not be useful as a flowering "tree."

The following corrections to the Winter, 1974, issue of *The Green Thumb* are belatedly offered to rectify typographical errors:

Inside front cover: Drawing by Ann Pappageorge.

Article entitled "The House at 909 York", Sources, page 109:

Davis, Sally, and Betty Baldwin, *Denver Dwellings and Descendants*. Sage Books. 1963.

Fisher, Alan, architect, interview.

Exotics of COLORADO

CROCUS, *Crocus* spp.

Helen Marsh Zeiner

Crocuses are among the best known and best loved of all the early spring flowers. Blooming before the grass-like leaves appear, their bright colors and comparatively large size makes them conspicuous in the bare March landscape. When the crocuses bloom, we feel that spring is here.

Although crocuses are well known to all gardeners and most non-gardeners as well, there are many bits of information about crocuses which perhaps you did not know.

Did you know, for example, that these low-growing flowers are related to the garden iris from which they differ so markedly in appearance? They are both members of the iris family, *Iridaceae*, a family of about 60 genera and 1,000 species with usually showy flowers, including crocus, iris, gladiolus, freesia, tigridia, and tritonia or montbretia.

Did you know that, although we refer to crocus bulbs, they are really corms? Both bulbs and corms are efficient underground reproductive structures. A corm is a shortened, erect, fleshy food-filled underground stem with a few roots at the base and a few thin, scaly leaves at the top. In a bulb, the proportion of the stem is very small and most of the food is stored in fleshy scale leaves as in the onion.

Did you know that horticulturists divide crocuses into spring-flowering and autumn-flowering species? True autumn-flowering crocuses are not well-known

among gardeners and are often confused with the autumn-flowering colchicum. *Colchicum* bears a superficial resemblance to *Crocus*, but it is a member of the lily family, *Liliaceae*, and its botanic structure is different from that of *Crocus*. This is a case where the same common name (autumn crocus) is applied to two quite different plants and is, therefore, confusing.

Speaking of names, did you know that the common name crocus is the same as the genus name *Crocus*? The name *Crocus* was given to this genus by Theophrastus, a Greek botanist who lived from 372-287 B.C., and who is sometimes called "the father of botany". The word crocus comes from the Greek *kroke*, or thread, and refers to the large, conspicuous stigmas of the autumn crocus.

Did you know that there are about 75 species of *Crocus* found growing naturally from the Mediterranean region to southwest Asia? Species of crocuses are sometimes grown by crocus fanciers, but the common garden crocuses represent only four or five species with numerous horticultural varieties. The common spring-flowering crocuses are basically purple, white, or yellow, but there are many shades of these basic colors.

Crocus vernus All. is a common garden crocus with lavender, white, or striped flowers. It is native to south and central Europe. Many varieties of garden crocuses are derived from *Crocus vernus*.

Cloth-of-gold crocus, *Crocus susianus*

Ker., is one of the most showy early crocuses because of its masses of yellow-orange flowers. It is native to Crimea. It is said that this species was cultivated by the ancient Persians. It was reported to have been introduced into Europe from Constantinople in 1587.

The popular Dutch crocuses are mostly hybrids of *Crocus moesiacus* Ker. Although the hybrids have been developed in Holland, the species is native to southeast Europe and Asia Minor.

The autumn-flowering crocus, or saffron crocus, is *Crocus sativus* L. From earliest times it has been valued for use in medicine, as a condiment, and as a dye. The yellow saffron bread of Wales is colored with saffron made from the dried, orange-colored stigmas of this crocus. It is estimated that the stigmas from 4,000 flowers are needed to pro-

duce one ounce of commercial saffron. The spring-flowering crocuses are valued for their beauty alone.

Did you know that in Ireland crocuses are called St. Valentine's flowers? The Irish believe crocuses bloom to greet St. Valentine on his day. These early blossoms are carried to St. Valentine's shrine. Yellow flowers are picked, because there is a superstition that fairies might take shelter in purple flowers but have no use for yellow ones.

Did you know that spring-flowering crocuses are among the easiest of all "bulbs" to grow? Planted about 4 inches deep and about 4 inches apart in good loamy soil, they will multiply and brighten the garden for years. March is the month for crocuses, but they may start to bloom in February and blooms may last into April.

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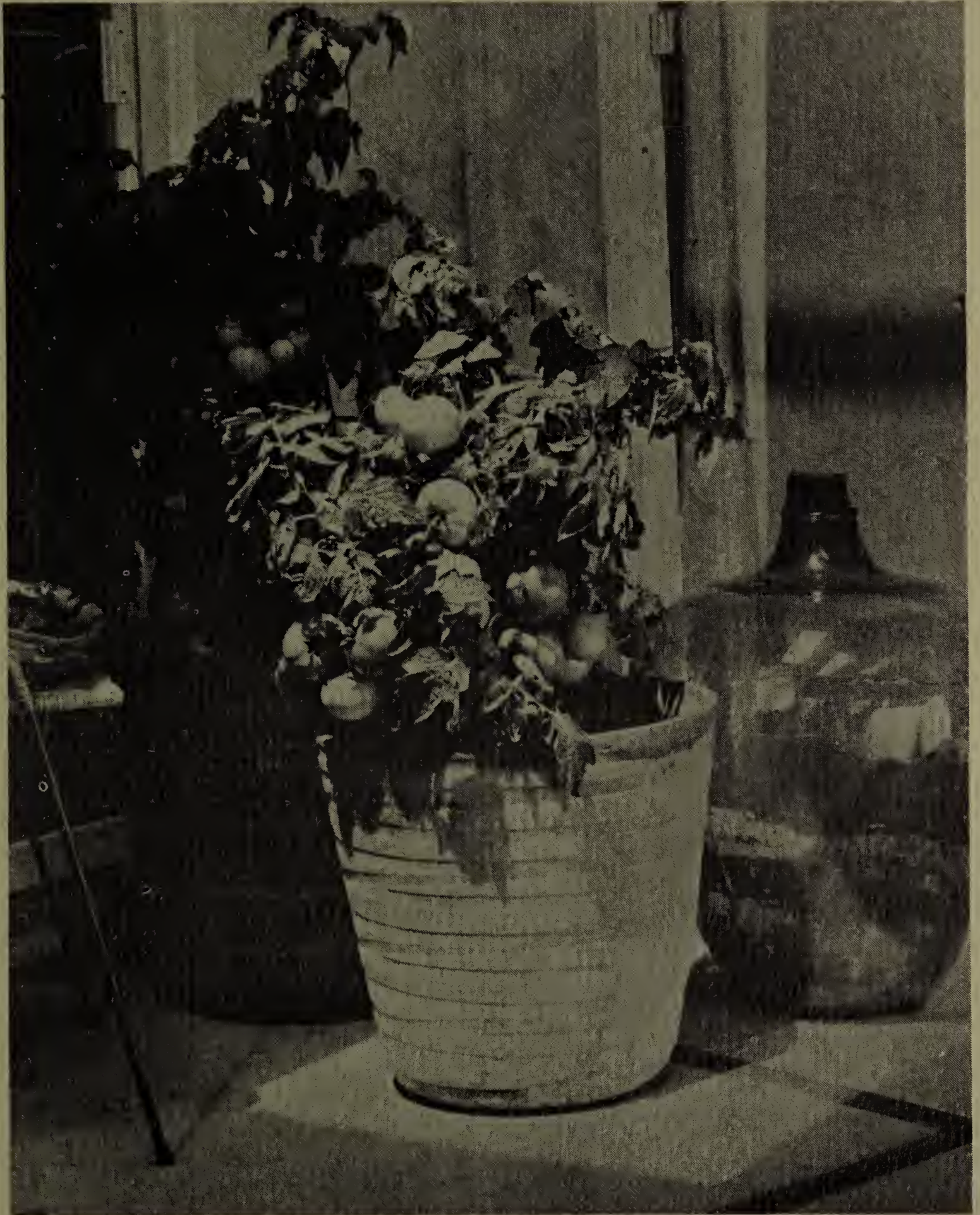
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THE COVER

Patio Tomato

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SECURITY LIGHTING AND ITS IMPACT ON THE LANDSCAPE

Henry M. Cathey
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The following article is reprinted in part, with permission, from pamphlet CA-NE-7, November, 1973, of the U. S. Department of Agriculture, Agriculture Research Service, Plant Genetics and Germplasm Institute, Agricultural Environmental Quality Institute, Beltsville, Maryland.

Since numerous streets in the Denver area are presently illuminated with high-pressure sodium lights, and plans have been made for additional HPS lighting, the article is pertinent to local problems and should be of interest to local residents.

Recent programs of installing security lighting in our urban areas may have a major impact on mankind and on all the other organisms that share the landscape. Artificial lights have been designed for one primary function — to give mankind visibility in the dark. Good visibility is a basic requisite for public safety; it also permits prolonged periods of activity during each day. Although the motivation for the installation of artificial light has always been the comfort and security of mankind, the same sources of illumination can

alter the activity of all organisms on the landscape. We have only to step outside on a summer night and view the extensive collection of night-flying insects that have been attracted by the porch lights. The same light — with a yellow coating — becomes a bug lamp. Bug lamps emit much less blue light and thus are much less attractive than ordinary lights. These same lamps have also been the basis for the technology that permits ornamental plant growers to shift and regulate the growth and flowering times of many kinds of plants.

Acer platanoides
(Norway Maple)
High Sensitivity
to Security Lighting



Light Sources for Vision Lighting

Sunlight emits light in the visible region . . . from blue to green to yellow to red. The red region of the spectrum regulates the photo-period responses of plants. The red and blue regions activate chlorophyll for photosynthesis. The blue region attracts night-flying insects.

Before 1950, electric incandescent filaments and gas lights were used for outdoor lighting. Levels of illumination were below 1 foot-candle except in concentrated urban areas. Night-flying insects were attracted to the lamps.

Between 1950 and 1965, mercury lamps, which use one-third to one-fifth the electricity of incandescent lamps, permitted better visibility. The use of outdoor lighting subsequently increased. These lamps emitted blue light but little red and were attractive to night-flying insects. No effects of light were reported

except for extremely light-sensitive plants such as poinsettias in greenhouses.

Metal halide lamps, which have better color emission and greater efficiency, were an improvement over mercury. Recent improvements in mercury with phosphors, however, have resulted in color rendition similar to metal halide.

About 1965, the introduction of high-pressure sodium (HPS) lamps gave street lighting a yellow-colored lamp with approximately double the efficiency of mercury lamps. These lamps emit less blue light with more yellow and red light.

Present use of high-intensity discharge lamps in malls, parks, and residential areas varies from 1 to 5 footcandles, depending on distance between lamps. Urban areas would normally be expected to have higher levels than sparsely settled regions.

Three questions that arise are: Do

these HPS lamps have more effect on altering the growth of plants than the ones that they replaced? What is the effect of increasing the intensity of light throughout urban areas? What kinds of changes in plant growth should we expect from the new security lighting?

To answer these and related questions, we should first summarize how photoperiod regulates the growth of plants.

Photoperiod

Day-length effect on plants has been identified for more than 50 years as the major signal from the environment that regulates plant response. From these observations, we now know that light-dark cycles during the 24-hour day trigger the flowering, branching, dormancy, bulbing, and many other growth

responses of plants. Studies of artificial light sources enabled USDA research scientists to discover that the red part of the visible spectrum was the triggering light. Artificial light helped them to identify and isolate “phytochrome” — a blue, photoreversible pigment whose red (580-700 nm) and far-red (700-850 nm) absorbing forms regulate plant responses. Any light source that affects the photoperiod responses of plants acts through its red content. Incandescent-filament lamps, whose radiation is primarily in the red region, are the standard source for adjusting the photoperiod of plants.

Plants may be classified into three major types: short-day, long-day, and day-neutral.

Short-day plants continue in vegetative growth or in flower only when the length of the daily light period is less than a critical number of hours. Daily light periods shorter than the critical number promote vegetative growth or flowering. Daily light periods longer than the critical number inhibit vegetative growth or flowering.

Long-day plants continue in vegetative growth or flower only when the daily light period is longer than the critical number of hours. They become dormant or form rosetting plants when the daily light period is shorter than the critical length.

Day-neutral plants continue in vegetative growth or flower regardless of the day's length.

Light throughout the 24-hour day inhibits flowering and promotes vegetative growth of short-day plants, encourages continued vegetative growth and early flowering of long-day plants, and increases stem lengths of day-neutral plants. Plants vary greatly in their responsiveness to light source, duration, and intensity. Since the new light source, HPS, provides illumination from dusk to dawn at intensities seldom before used for street lighting, many questions have been received from florists and nurserymen concerning what



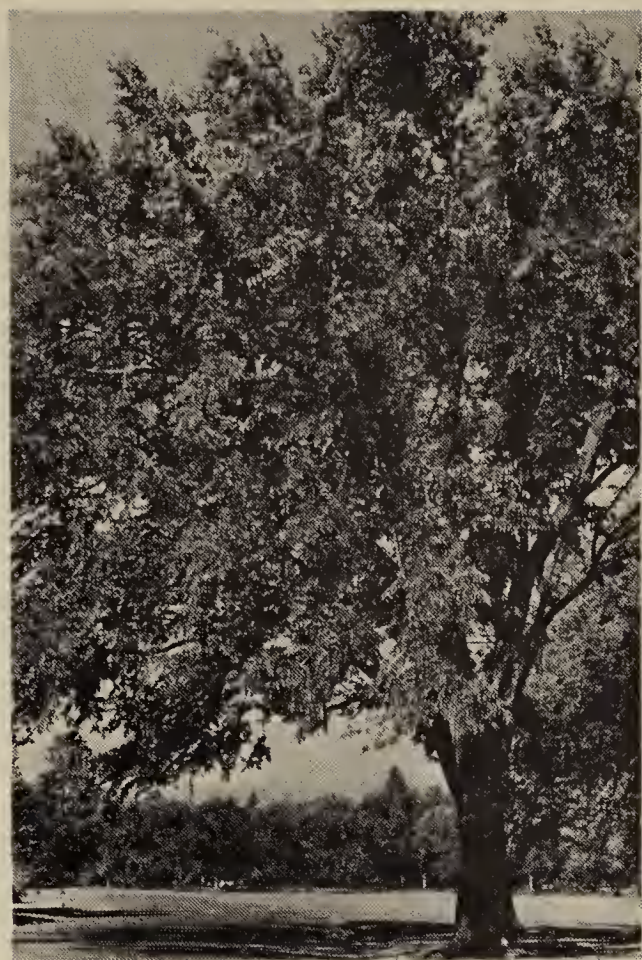
Catalpa bignoniodes (Catalpa)
High Sensitivity to Security Lighting

effect these lights would have on their fields and greenhouses adjacent to the brightly lighted areas. Poinsettia, chrysanthemum, and orchid growers learned the first year that their plants had to be covered nightly in order to avoid altering their scheduling of flowering. Into the fall season young plane trees (sycamores) in the nursery grew more rapidly and much later than plants of a similar age that had been screened from the night lighting. Winter dieback was severe on the lighted trees during the following spring.

Experiments on Relative Effectiveness

Experiments were conducted at the Beltsville Agricultural Research Center, Beltsville, Md., to determine the relative effectiveness of five light sources on photoregulation of 22 species of ornamental plants. An abstract of the research was published in *HortScience* for the August 1973 meeting of the American Society for Horticultural Science:

“Abstract. When compared at a level of 1 ft-c. for 16 hrs at a night temperature of 68°F the 5 light sources delayed flowering of short day plants (chrysanthemum, marigold, rieger begonia), promoted vegetative growth of woody plants (2 species of *Ulmus*, 2 species of *Acer*, *Koelreuteria*, *Rhododendron*, *Rhus* and *Zelkova*), and promoted flowering of long day plants (Marguerite, carnation, petunia) in the order from most to least effective: Incandescent (INC) > High Pressure Sodium (HPS) >> Metal Halide = Cool White Fluorescent >> Clear Mercury. Poinsettia, *Betula*, *Catalpa*, *Platanus* and *Tilia* continued to grow vegetatively in response to all sources. *Ilex* and two species of *Pinus* did not respond to any of the light sources. Lighting with HPS lamps had to be increased at least 4- to 8-fold (on a ft-c. basis) to regulate vegetative growth of long day plants and delay the flowering of short day plants in comparison to



Ulmus americana (American Elm)
High Sensitivity to Security Lighting

INC lamps. HPS lamps were ineffective in promoting early flowering of long day plants, regardless of intensity or duration.”

Based on this abstract and subsequent interviews, we have received numerous requests to clarify the impact of the new street lighting technology on plants in the landscape.

1. Is there a combination of factors involved, all of which must be eliminated, or is there a single key factor at the root of the problem?

Light exerts its growth-controlling effects only when the environmental and cultural conditions are properly combined to permit rapid growth. Any factor that would limit growth — cold, heat, drought, standing water — could override the effects of the security lighting. Light alone, at the intensities used for street lighting, is insufficient to sustain growth. Its effects come into force only when the natural day is adequate to permit growth. Thus, night temperatures below 55° or above 90°F

limit the effectiveness of the night lighting. Periods of extra dry or wet weather would limit growth and thus reduce the sensitivity of the plants to the night lighting.

2. Wouldn't mercury lamps (or any light source) produce the same result with higher than normal light levels?

The effectiveness of a light source is dependent on its radiation in the red region. Mercury lamps emit little radiation in the red region; thus, any increase in the intensity of light from this source would not be expected to have any more effect than a less intense lighting level. Color-improved mercury lamps are essentially the ordinary mercury lamp with a fluorescent powder covering the inside surface. Little red radiation is produced, since again the improved lamps would have no detectable effect on most plants.

3. Do mercury vapor and metal halide lamps cause the same response in plants as does the high-pressure sodium lamp?

All lighting that produces long-day effect on plants exerts the same growth control of promoting the formation of new leaves and the elongation of the distances between the leaves. Mercury vapor and metal halide lamps emit so little red light that they delay flowering only on a greenhouse crop such as poinsettia and promote continuous vegetative growth only on highly responsive trees such as birch, elm, and sycamore. Only 7 of the 22 species tested exhibited any growth responses to the mercury vapor and metal halide lamps. However, HPS lamps altered the growth responses of 16 of the 22 species tested, only one less than the number of plant species that were responsive to night lighting with incandescent-filament lamps.

4. We would like to know whether the increased plant growth is due to light quality or intensity or to a combination of both?

The increased growth is in response to a combination of light quality, intensity, and duration interacting with the environment. The significant change from the older street lighting systems to the HPS lamps is the change in the intensity of lighting at street level and plant height. It is probably two to four times higher than was formerly used — as measured on a footcandle scale.

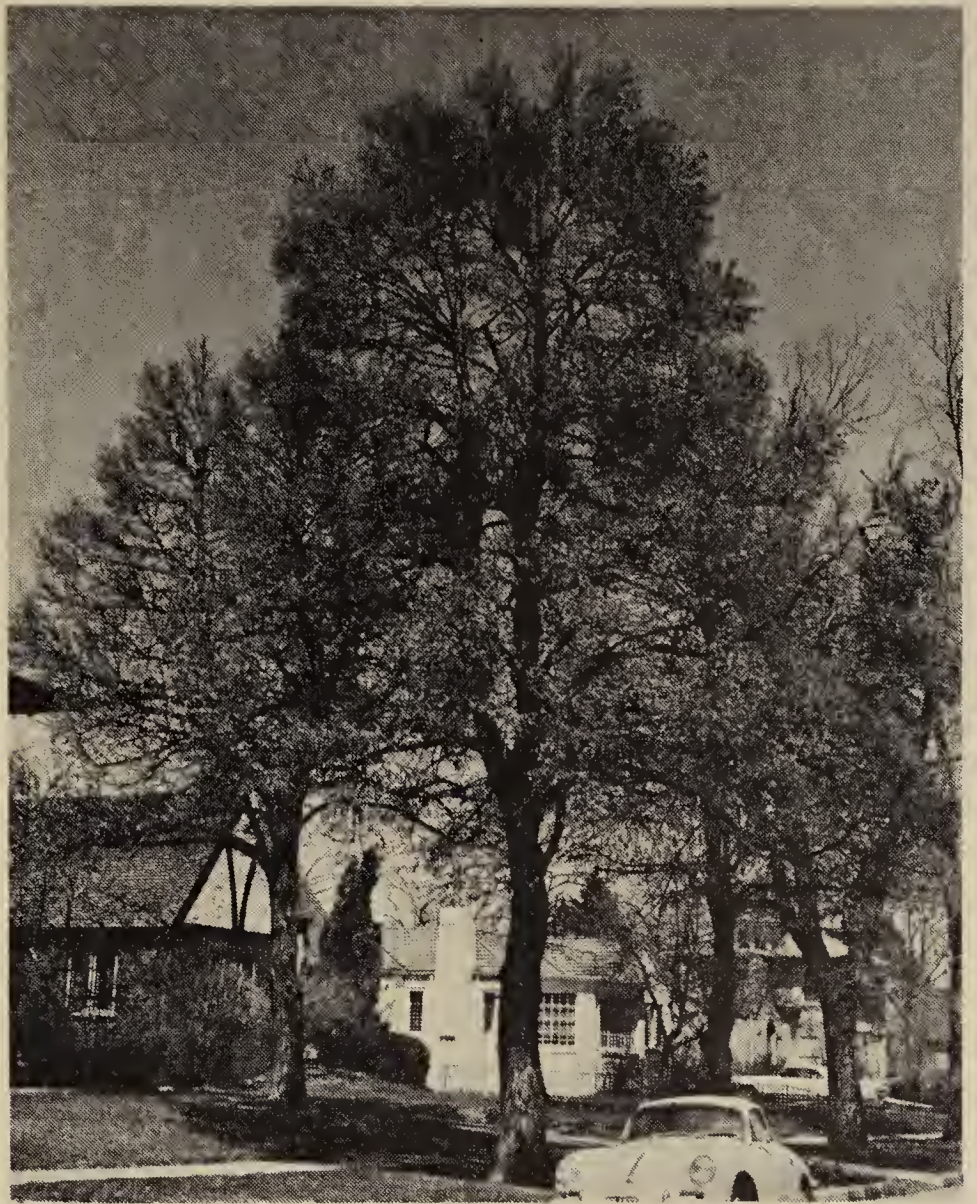
5. Are trees affected because of the sodium source itself?

The light emission of sodium at 589 nm — the so-called sodium line — produces its growth effects on plants. Since the lamp is operated at high pressure, the light spectrum that is emitted broadens into green on one side and red on the other side of the yellow line. Phytochrome, the blue pigment that is present in the leaves and that perceives the light, responds to the red part of the light. To the plant, the yellow source acts as if it were a red source. Thus, what appears to our eye is viewed quite differently by the plant.

6. Are trees affected because of the continuation of a minimum level of light, daylight and artificial, on a 24-hour basis with no opportunity to rest?

Growth responses that are due to photoperiod have no relationship to the concept of rest. This is a concept that mankind brings from its own way of living to the plant world. Plants live out-of-doors throughout 12 months and adjust their growth patterns in response to the light-dark signal from the environment. Their actions are modified by

Tilia cordata
(Littleleaf Linden)
Intermediate Sensitivity
to Security Lighting



temperature, carbon dioxide, nutrition, water, and many other factors. Continuous lighting depresses the formation and maintenance of chlorophyll in leaves and promotes the lengthening of the internodes of the branches and expansion of the leaf area.

All of these changes increase the likelihood that the leaves will be more sensitive to air pollution during the growing season. Most daily newspapers report the concentration of oxidants in the atmosphere based on the standards of measurement established by the Council of Government's Air Quality Index. Air pollution alerts are called when the level of oxidants in the atmosphere exceeds 100 parts per 100 million (by definition). Plants in a state of more rapid growth face a greater risk of being injured by the increasing levels and frequencies of air pollution than plants growing without security lighting. One can detect air pollution injury on the recently matured leaves, as they will initially have a glistening, oil appearance.

The tissues between the veins of the leaves may turn pale green to white. The margins of some leaves may dry to tan and may eventually rupture. The oldest leaves may progressively die and drop from the plants.

7. We are currently building a massive development where high-pressure sodium street lamps are going to be used for security purposes. We plan to plant trees 4 inches or larger in caliber (stem diameter). Will the lamps 40 feet high have an effect on these new trees?

The effects of the lighting will depend on the type of tree selected for the area and on how close the lamps will be to the trees. For example, a 400-watt HPS lamp on a 30-foot pole emits about 1 footcandle of light 20 to 30 feet horizontally on the ground. The light level increases as one moves closer to the light source.



Koelreuteria paniculata
(Goldenrain-tree)
Intermediate Sensitivity
to Security Lighting

Sycamores and elms, for example, should be expected to respond to the lighting during their first years by continuing to grow for a longer period in the fall. Other species would exhibit intermediate or low growth responses to the security lighting.

8. Would shutting off the light source for a given period of time each night reduce the effects of the lights?

The response of the trees is based on continuous illumination from the time of intense sunlight and continued by the artificial light. The maximum effectiveness of the light is dependent on the fact that the light continues uninterrupted throughout the 24 hours. Continuous lighting permits the minimum intensity of light to exert its effects in creating a long-day effect on plants. One simple method to reduce the effectiveness of the lights in regulating plant growth is to shut off the lamps for 2 to 4 hours during the early part of the evening. This dark period permits the plants to reset their timing system. From a security viewpoint, however, darkened areas during the early evening would defeat the purpose of the lighting — to permit continued surveillance throughout the night.

Alternatives

We can expect the continued installation of security lighting throughout the United States in order to maintain good visibility. Each of us can influence this trend by considering the following alternatives:

Selection of lamp type. — HPS could be used where high visibility on streets or freeways is required and where only light-tolerant plants would be used. Although less efficient than HPS lamps, metal halide lamps would be preferred in malls, parks, and residential areas where dense plantings are made and where color rendering of plants, people, and buildings is desired.

Shielding. — The least expensive fixtures (luminaires) often emit light in 180° radiance under the lamp. Covering lenses or shields can sometimes be used to direct the light to the street and away from the plants. More expensive fixtures have additional built-in shielding to aid in controlling light.

Selection of plants. — Cooperative work of urban planners, landscape architects, and horticulturists should be started to identify which plants are suited to the environment of security lighting. Some commonly used street trees such as elm and sycamore may have to be avoided in future plantings.

With the great variety of plant material available and often not considered, environmentally adapted plantings can be planned.

Installation and maintenance programs. — New plantings could be installed in the fall months of the year to permit a full-year cycle of growth and adjustment prior to the following summer and fall, when the major impact of the lighting is expected to occur. To slow growth during this period and during subsequent years, the frequency of watering and the level of fertilizers

should be reduced. Maintenance programs during the first years of growth can greatly help to decrease the sensitivity of the plants to security lighting, as well as to heat, cold, drought, air pollution, and salt injury. However, the majority of plants brought into urban areas die, because there is no maintenance following their installation into the landscape.

The Ornamentals Laboratory plans to continue research in its greenhouses and in cooperative projects with urban planners and horticulturists.

Sensitivity of 18 trees to security lighting

High	Intermediate	Low
<i>Acer platanoides</i> (Norway maple)	<i>Acer rubrum</i> (Red maple)	<i>Ilex opaca</i> (American holly)
<i>Betula papyrifera</i> (Paper birch)	<i>Ginkgo biloba</i> (Ginkgo)	<i>Liquidambar styraciflua</i> (Sweetgum)
<i>Catalpa bignoniodes</i> (Catalpa)	<i>Gleditsia triacanthos</i> (Honeylocust)	<i>Magnolia grandiflora</i> (Bull bay)
<i>Platanus acerifolia</i> (Sycamore)	<i>Koelreuteria paniculata</i> (Goldenrain-tree)	<i>Pinus nigra</i> (Austrian pine)
<i>Ulmus americana</i> (American elm)	<i>Sophora japonica</i> (Japanese pagoda-tree)	<i>Pyrus calleryana</i> (Bradford pear)
<i>Zelkova serrata</i> (Zelkova)	<i>Tilia cordata</i> (Littleleaf linden)	<i>Quercus phellos</i> (Willow oak)

Plants have been listed alphabetically and are not grouped in descending order of sensitivity. A high, intermediate, or low rating identifies the relative responsiveness of the plants to security lighting. Plants with low sensitivity would be preferred in areas with security lighting.

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VEGETABLE GARDENING ON YOUR LANAI

Richard Hannigan

This is the time of year when a multitude of vegetable gardening articles appear in publications, most of them directed to the backyard gardener. There is little information available which is specifically written for the apartment, lanai, or small courtyard gardener. Many such people can find great enjoyment and relaxation in gardening on a small scale.

The primary requisite is to have good sunshine for at least a half-day, and preferably more. This means that a south facing location is best, but an east or west exposure will do. North facing locations are difficult spots for growing vegetables, yet such flowers as fibrous begonias, impatiens, lobelia, and a few others will do well.

Containers

Containers are an important consideration. The lanai gardener is usually faced with a shortage of space and must find ways to make all available room useful. Highly recommended is the ordinary clay pot, usually in a 12 inch size, although the 10 inch will do. These are available locally and can be used year after year. Do not make the mistake of dumping out the soil in the fall so that you must refill containers the next

spring. Soil saved in pots through the winter can be rejuvenated by the addition of some organic matter, such as peat moss and used again.

Tubs, usually redwood, either square or octagonal, are also excellent if they are at least 12 inches across the top. Rectangular porch boxes are also good. Hanging baskets lend a gay note to your gardening and offer additional growing space but are more difficult to keep watered properly. The plastic baskets with the small saucer molded beneath are much more satisfactory than the old-fashioned moss-lined wire baskets.

A note of caution when you are arranging your lanai garden, particularly on the upper floors of an apartment house. Provision must be made to catch or direct excess drainage water so it will not drip on your neighbors below. Saucers are a great help and will also prevent stains if you have a concrete deck. Most apartments have a safety regulation concerning hanging planters outside the protective railings or setting pots upon these railings. It is perfectly all right to hang a pot or porch box inside the rail, making sure it is well fastened. A location near the top of the railing has the advantage of getting a great amount of sunlight.

Soil

After choosing the proper type of container for your use, you must provide and prepare the soil. As the commercial plastic bags of potting soil contain a great deal of finely ground peat and vermiculite, both of which tend to pack together and stay wet too long, a good mixture to use is one-half potting soil and one-half good garden soil. Mix the two together, adding a tablespoon of either bonemeal or phosphate to the amount needed to fill a 12 inch pot. The most practical place to obtain the garden soil is from a friend who has gardened in the backyard for some time. The amount you should need will not deplete the friend's garden and will help you. You can also obtain soil at a commercial greenhouse or garden center.

When filling containers, it is important to place a suitably sized rock over the drainage hole in pots and either rocks or small pieces of screen over the holes in the bottom of wooden boxes.

Plants

Most plants for lanai gardening are grown from seed sown directly in the containers. Exceptions are tomatoes and green peppers. When sowing seed, have the soil well pulverized on top of the container, spread the seed thinly, depending on what crop you are sowing, and cover it with a mixture of peat moss and soil. The purpose of covering with this mixture is to help maintain a more uniform moisture condition until the seeds sprout. A general rule is to use enough soil to cover the seed with 4 times its diameter. An aid in keeping moisture in the soil until seeds germinate is to cover the container with a plastic wrap. Be sure to remove the plastic when germination has started.

Tomatoes and peppers, which you should grow from started plants, are best purchased at a local greenhouse or garden center. Do insist on getting the variety you desire. Most reputable firms

will have everything well marked.

The crops with which you can expect to succeed are many. Your individual space considerations will determine the number and kind of plants. The following information should help you to make intelligent decisions for your lanai garden.

Lettuce is a favorite, and it grows quickly and easily. When ready to start eating, it will provide the succulent leaves over a fairly long period of time. Varieties usually available are Black Seeded Simpson and Grand Rapids. Do not buy head lettuce for you will usually be disappointed. A good thing about the lettuce family is that you can eat the outer leaves and the center will continue to grow. Four to 6 inches apart is the proper spacing for plants when you thin out the original seeding.

Another favorite is spinach. Spinach grows quickly and has a fine taste, whether eaten raw in a salad or cooked. Dixie Market is a suitable variety. Like lettuce, the outside leaves may be eaten while the plant continues growing. A good idea with these 2 vegetables is to make successive sowings about 2 weeks



Lettuce



Peas

apart, starting in mid-April and again about May first. Space the plants about 4 inches apart.

Radishes grow very quickly, requiring about a month before harvest time. It is very easy to get too many radishes, so unless you are a devotee of the little hot roots, don't plant too many. Early Scarlet Globe is a fine variety. Space the plants at 2 inches. Many gardeners place their radishes in odd spaces with other plants since the radish takes little space.

If you select the newer small size carrots, you will do well with this vegetable. Burpee's sell a variety called Little Finger which produces fine 3 to 4 inch carrots. You can choose larger carrots such as Danvers or Chantenay and eat them before they grow to maturity. The young carrots do taste better. Spacing should be 2 to 3 inches for good results. The foliage is attractive, perhaps the most attractive of all the vegetables. Plant in late April or early May, and be aware they are not quick to germinate, so give them time.

Onions are another rewarding vegetable and also lend themselves to being planted in odd places. The White Lisbon Bunching variety is a good one,

growing readily from seed. Plant in early April, about one inch apart, or thin to that dimension. Onions can be pulled for eating almost anytime after they obtain sufficient size. Do not attempt the large globe type onions for their season is long.

Related plants are chives and garlic. Chives can be purchased in small pots already started. Plant them outdoors in summer and, when frost comes, cut them back and bring inside to grow in a sunny window for a garnish through the winter. Garlic can be grown from grocery garlic bulbs by separating the small cloves and planting among your other plants. Almost all organic gardeners believe that garlic is a good insect repellent. Try it.

Undoubtedly, the most satisfying plant is the tomato, providing you choose a variety suited to lanai gardening and plant it where it will get a great amount of sunshine. The variety Patio, a dwarf, compact plant with a strong stem and good leaves, has been very successful. Fantastic is another good variety, which must be staked for best results. It is important that the tomato gets sufficient water, particularly when pot grown. Proper watering means applying a large enough quantity of water on a particular day to thoroughly wet the entire soil ball. THINK as you water; a pot which contains perhaps 12 quarts of soil will not get wet with only a few cups of water. When a pot is on the dry side, most of the first water you apply merely runs down the crack between the pot wall and the soil ball and out the bottom. The second dose of water will begin to soak into the soil, because, by then, the crack has swollen shut and water will penetrate. Keep applying water until you are satisfied that the entire pot is uniformly moistened.

When growing tomatoes, it is important to remove the small growths called suckers, which occur in the leaf axils. If you don't know, ask someone to show you. Other tomatoes which do

well in lanai culture are the Red Cherry and the Yellow Pear, BUT ONLY if you limit the amount of growth by pruning off some shoots. Yellow Pear will grow in a hanging basket by limiting it to 3 stems which will hang down by the force of gravity as the stems get longer. The miniature variety, Tiny Tim, produces a good quantity of very small, marble sized, fruit. Most people grow it as a novelty. By all means, buy started plants, preferably sturdy ones about 6 to 10 inches tall.

One or 2 green peppers can be fun to grow and since they are a long season plant, you should get them from a greenhouse or garden center. Yolo Wonder and California Wonder are varieties to look for. Hot peppers are usually available if they appeal to you. Pepper plants need a great amount of sun. When purchasing any plant, always look on the underside of the leaves to determine if green aphid or red spider is present. Just a few of these pesky insects on a plant when you buy can become a major annoyance in the garden later on.

The vine crops, such as cucumbers or squash, can be made to perform well in lanai gardening if provisions are made for a place to let the vines run. It is a good idea to grow these items vertically, such as up a netting attached to your railing, or possibly to a wall, if not too hot a location. Vines can be grown in large pots if an upright stake is first placed in the center of the pot. Ideally the stake should have several small cross-pieces to provide a place to tie the vines. Old nylons make good ties, much better than thin string, and twistems are also good.

The summer varieites of squash, such as the Crooknecks, either White or Yellow, are the best ones to grow, but there are other varieties as well. Zucchini, while popular in the backyard, grows too large for most lanais. Usually 3 seeds planted in one place are best. Cucumbers can be treated in the same

manner, and there are many good kinds, one being Marketeer. Burpee's offer good early maturing hybrids.

Beans and peas can be grown, but only if you have a larger space. An 8 foot row of beans will provide enough for one person, so you see, you need considerable space to feed 3 people. Peas take even more space to give a satisfactory harvest. Should you elect to try beans, buy the pole type, such as Kentucky Wonder or Blue Lake Pole Bean.

In addition to the previously mentioned vegetables, you can grow such items as beets, turnips, eggplant, and others. Your success will depend on your location and amount of time and space you can devote to your garden. Best advice is to stick to fewer plants and try to do a superior job with them for the most satisfying lanai garden.

A moderate application of a balanced fertilizer applied twice through the growing season will be satisfactory. Do



Cucumbers

not over-fertilize.

There are many good publications concerning gardening in general and one of the best sources of information is the Denver Botanic Gardens Library. While it is necessary to be a member to check books out, it is money well spent to join this fine organization. Newspapers and magazines also provide some infor-

mation, but keep in mind that lanai gardening is somewhat different from gardening on a bigger scale in the yard. Also remember that many books are geared to conditions in other parts of the country and the instructions must be modified for our Colorado climate and shorter season.

Happy Gardening!

MY GARDEN EXPERIENCE

Mary Sloan*

When I first came to my garden plot, it looked just like a vacant lot.

I removed all the rocks and turned over the soil so the seeds could get water and wouldn't spoil.

After I planted all the seeds, up came the vegetables along with the weeds. It didn't take long before I was a pro at spotting any old weed that would show.

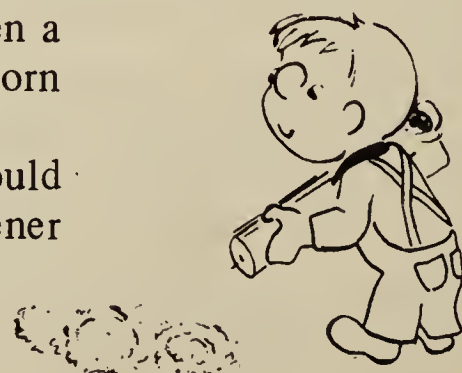
I pulled and I tugged and I hoed and I dug, and when I wasn't looking, came old mister bug.

So we sprayed and we prayed and we prayed and we sprayed, and I think both the weeds and the bugs were afraid.

All of this time with my worries and my fears, my vegetables were growing up 'round my ears.

There's tomatoes, cucumbers, and even a beet, and carrots and squash and corn so sweet.

I never knew that growing things could be such fun. I guess I'll be a gardener and follow the sun.



*Mary Sloan, age 11, is a gardener in the Children's Garden Program.



SHADE TREES FLOWER, TOO!

E. Alan Rollinger
Landscape Designer

This is the second of two articles dealing with trees in home landscaping by Mr. E. Alan Rollinger. In his work as a landscape designer, he has spent many years studying the trees used in Denver landscaping.

When invited to write about flowering trees, I immediately asked which flowering trees. Most trees flower, some more conspicuously than others, but many people think only of smallish, ornamental trees, such as crabapple or plum, to the exclusion of many other desirable flowering trees. Let us consider some trees usually classified as shade trees which have beautiful flowers.

A very showy tree in bloom is western catalpa (*Catalpa speciosa*). Creamy white flowers, two inches in diameter, with yellowish and brown markings, are arranged in upright panicles six inches high. Appearing in June, these orchid-like, fragrant flowers, in combination with the large leaves, give this tree quite a tropical appearance. Catalpa has a reputation as a "messy" tree because it drops flowers and fruit as most trees do. I expect anyone reading this article bases aesthetic appreciation of a particular tree on values other than whether it is "messy" or not. The western catalpa is also one of the most rugged trees we can

plant here along the Front Range. Chinese catalpa (*Catalpa ovata*) is a smaller version with more slender pods.

Seldom noticed at flowering time are lindens. Most people are aware of a marvelous fragrance but few realize it comes from a linden. Small yellowish-white flowers are borne in pendulous clusters in late June or early July. A number of lindens are available in this area. American linden (*Tilia americana*) is a big, rather open tree with large leaves, while a more compact specimen is pyramidal American linden (*Tilia americana fastigiata*). The Redmond linden (*Tilia euchlora* 'Redmond') is also a pyramidal form and one of the most favored lindens. Perhaps most neglected is the little leaf linden (*Tilia cordata*), which is unfortunate, since this is a tree of dense, pyramidal habit that sheds early snows and rarely needs to be pruned or fussed over in any way. The best known selection is called greenspire linden (*Tilia cordata* 'Greenspire'). An alley of this species has been planted along the walk-

way between Boettcher Memorial Center and Botanic Gardens House.

One of the most beautiful signs of coming spring are the Norway maples (*Acer platanoides*). Before the leaves appear, the small, yellow flowers bloom in conspicuous clusters during late April or early May, creating a mass of color, ranging from yellow to chartreuse, and visible from a considerable distance. More widely planted in the Denver area has been the Schwedler maple (*Acer platanoides Schwedleri*), a selection made for its red foliage most apparent during spring and early summer. Flowers are also yellow but with red peduncles and are soon accompanied by emerging red leaves. This combination is a spectacular sight, especially when enhanced by mass planting. When fully

grown, these "hard" maples make attractive specimens all seasons of the year.

Worthy of more extensive use are the buckeyes and horsechestnuts. Fine specimens can be seen around Denver, particularly in the parks and around the older schools. In the past, with M. Walter Pesman as landscape architect, grounds were actually planted with a quantity and variety of trees.

Horsechestnut (*Aesculus hippocastanum*) flowers in late May or early June when the tree is in full foliage. The showy, white, upright spikes, six to twelve inches high, bloom at a time when most other trees are past flowering and the horsechestnuts have the show to themselves. Two fine old specimens can be seen at the bottom of the hill directly



Horsechestnut

west of the Museum of Natural History in City Park. The Baumann horsechestnut (*Aesculus hippocastanum* 'Baumanni') is a popular selection bearing double flowers and is supposed to produce no fruit. Another species worth further trial in our area is the red horsechestnut (*Aesculus carnea*) with pink to red flower clusters.

Closely related to the horsechestnuts are the buckeyes, represented in this area by Ohio buckeye (*Aesculus glabra*) and the yellow buckeye (*Aesculus octandra*). Both flower with greenish-yellow, upright flower clusters, and while not as showy as the horsechestnut are still pleasing. Both have the added advantage of fine orange to red fall color. Ohio buckeye is a rounded tree, while the yellow buckeye is larger and less spreading. A fine example of yellow buckeye can be seen northwest of the Eugene Field House in Washington Park.

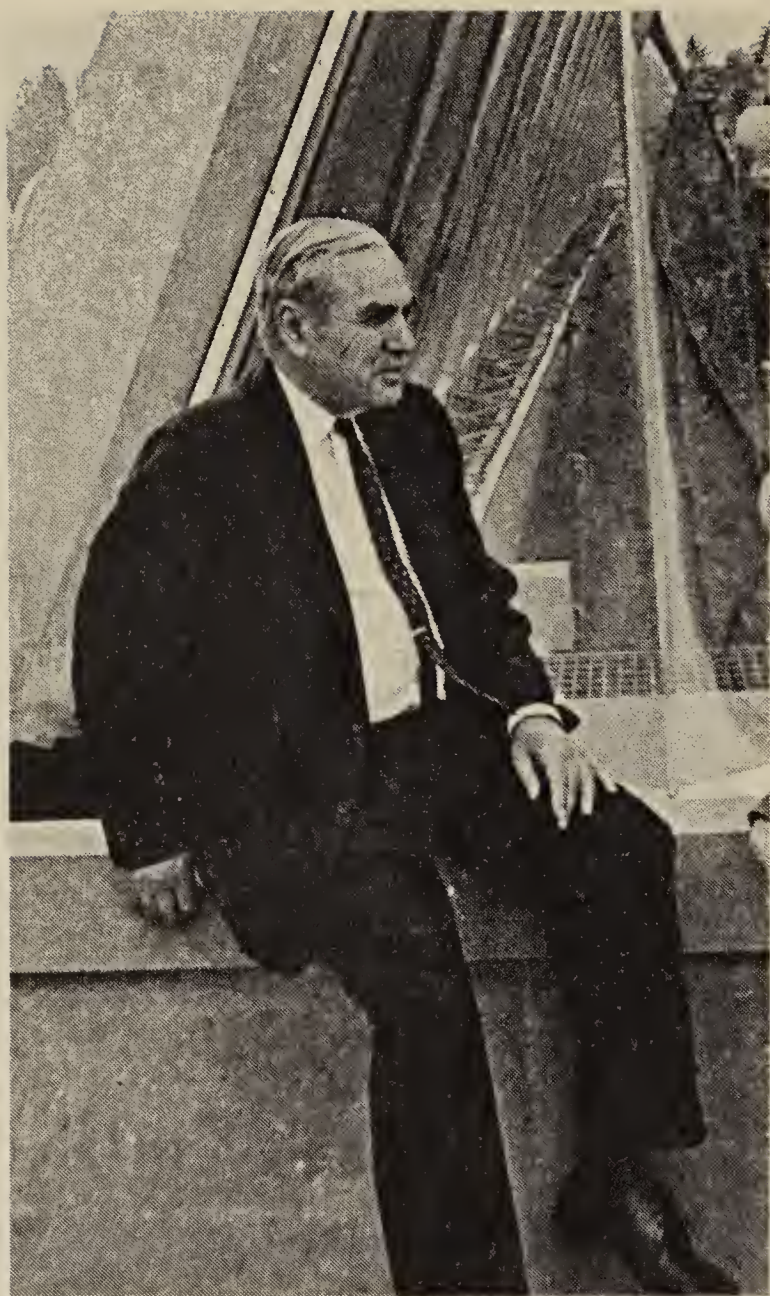
Japanese pagoda tree (*Sophora japonica*) is not as widely planted as the other trees discussed here but some good examples exist in this area, such as the large specimens growing south of the Museum of Natural History in City Park and a good-sized one growing in Broomfield. Any tree that will tolerate this "gumbo" soil, I think, is certainly worth a second look. This member of the pea family flowers in mid to late summer with white pea-like blooms in large, pyramidal, upright clusters. The fact that it is the only tree blooming at this time of the season makes it especially valuable. When planting a pagoda tree keep in mind that this is a tree that grows late into the season and can be damaged by early freezes. Choose a spot for planting where you can conveniently withhold water in late summer and early fall to force bud set and promote dormancy. This is a good practice for all shrubs and trees and enables plants to come through our early cold snaps with minimum damage. Needless to say a Japanese pagoda tree planted in a bluegrass lawn which is usually watered later into the season may



American Linden

have problems. In addition, choose a pagoda tree that is either low branched or multi-stemmed, or preferably both. Sunscald is a threat and any low branches will help the tree shade itself.

When selecting trees for your property, don't limit your choices. The trees considered here are doubly rewarding, being "flowering trees" as well as shade trees.



Dr. Aubrey C. Hildreth

A Tribute

Joseph W. Oppe

The early and mid 1960's represented a challenging and exciting era for the Denver Botanic Gardens. Much of the activity in those early, formative years can be attributed to the dynamic leadership of its director, Dr. Aubrey C. Hildreth. "Doc," as he was affectionately known to those of us who served with him, came to the Gardens in July of 1959, having already devoted what lesser men would consider a "lifetime" in the furtherance of horticulture.

At the time Dr. Hildreth accepted this new challenge the grounds of the York Street Unit were undeveloped, although a basic plan had been drawn up. There was much to be done and, with the enthusiasm and energy of a person half his age, he engrossed himself in the task. In short order, paths and roads were constructed, an irrigation system installed and test gardens of annuals and perennials established.

Perhaps Dr. Hildreth's single greatest achievement in those early years, and the one which provided him with the greatest satisfaction, was the establishment of the Children's Garden. Always an enthusiastic supporter of youth, he recognized that an early gardening experience was essential if the young people of Denver were to be offered an opportunity to develop an appreciation for the green world around them.

It was roughly at this point (January, 1963) that I joined the Gardens' staff. Having worked for the previous 3 years in the more horticulturally amenable climate of central Ohio, the complexities of growing plants in Denver was a new, exciting and, at times, frightening experience. A part of the responsibilities of my position was to edit *The Green Thumb*. One of my most vivid encounters with the vagaries of horticulture in the high plains came later in 1963. In an article in *The Green Thumb* (October, 1963, Vol. 20, No. 7) entitled "What's in a Name," I regressed back to my earlier experiences in Ohio and suggested that *Acer saccharum* was commonly grown in Denver as a street tree. Dr. Hildreth had not read the article prior to publication. Upon learning of my error, he called me into his office and very gently pointed out my mistake. During the course of this conversation, he impressed on me the fact that the written word, issued from a public horticultural garden, must be accurate as it may represent the only contact the institution has with much of the public. I have carried this lesson with me ever since and, whenever possible, have tried to instill it in my own staff.

Dr. Hildreth was a very warm and generous person. I came to the Gardens without ever having met him personally, although we had exchanged correspondence. From the moment I met him, and all through our subsequent relationship, he was always patient and willing, in the face of busy schedules and the urgencies of the moment, to lend a sympathetic ear. His words of wisdom, although often cloaked and presented in the context of his wit, were meaningful and I have cherished them ever since.

A firm opponent of "regionalism," Dr. Hildreth consistently encouraged and supported his staff's involvement in horticultural activities on the national and international level. Recognizing that our responsibilities transcended institutional bounds, he emphasized the importance of our participation in these areas which often were difficult to specifically relate to the Denver Botanic Gardens. This was a new and exciting concept to me since, prior to this, I had little or no recognition of the broader aspects of my professional obligations.

The 3 years from 1963 through 1965 represented a critical period in the development of the Gardens. The Boettcher Memorial Conservatory was designed (and partially constructed) and the Education Building was on the drawing board. During this time, the staff was small and the pressures great. However, at no time was there a breakdown in morale. Dr. Hildreth's wit and humor were always equal to the challenge and he never failed to keep up his cheery front. In retrospect, I now appreciate the stress he was under and recognize that a lesser man might have wavered and chaos prevailed.

Since 1965, when I left the Gardens' staff, I had the opportunity to visit with Dr. Hildreth many times. One of the most gratifying was in 1970 when he was selected as the recipient of the Arthur Hoyt Scott Horticultural Medal and Award. This honor, bestowed in recognition of his distinguished horticultural achievements, was presented during

Swarthmore College's commencement exercises. On this occasion, the President of the College read the following citation which succinctly enumerates Dr. Hildreth's contributions:

"In 1970 the Arthur Hoyt Scott Horticultural Medal and Award is presented to Aubrey C. Hildreth for his distinguished services to American horticulture. Dr. Hildreth was born near Mannington, West Virginia and attended West Virginia University where he received his B.S. degree in 1917. He continued his education at the University of Minnesota where in 1923 he was awarded his Ph.D.

For a period of nearly 40 years he pioneered the development of suitable horticultural practices for the Plains States of America. In 1930 he was appointed Superintendent of the Cheyenne Horticultural Field Station, Cheyenne, Wyoming. There he was active in the breeding of superior ornamental and crop plants.

Following his retirement from Cheyenne in 1959 he became Director of the Denver Botanic Gardens. While Director he guided this institution through its early stages of development to its present stature as a major horticultural institution.

Dr. Hildreth is one of the nation's leading authorities on Plains horticulture. Much of his professional work has been done in this general area exploring the "hows and whys" of the plant



Presentation of the highest honor of the American Horticultural Society, the Liberty Hyde Bailey Medal, to Dr. Hildreth, November 20, 1970.

world, especially in finding out how plants adjust to drought and cold. His interest has been how to develop better horticulture in the high, dry, cold, bright climates. He is a plant collector, a botanical gardens or arboretum scientist. His administrative ability and overall view of what needed to be done horticulturally, on a national and international scale, was and is without serious challenge."

During our 12-year friendship I was able to attain some insight into Dr. Hildreth's deep devotion to horticulture. Through his efforts, horticultural recognition for that vast area between the Mississippi River and the Coastal Ranges of California has been furthered. His influences, of course, have gone far beyond the local and regional scene and have had a positive effect on both the national and international levels. For this, Denver Botanic Gardens should be justly proud.

Personally, I will always be grateful for "Doc's" contributions to public horticulture. More importantly, I will always cherish his friendship and recall with deep fondness our association.



1975 GARDEN TOUR

The 1975 Garden Tour will be held July 23rd from 10:00 a.m. until 6:00 p.m. The gardens chosen are:

- 1) Mr. and Mrs. William B. Collister, 6320 E. Fourth Ave.
- 2) Mr. and Mrs. Joe Miller, 125 Jasmine St.
- 3) Miss Charlotte O'Malley, 322 Grape St.
- 4) Mr. and Mrs. W. Coles Hudgins, 4949 Sixth Ave.
- 5) The Children's Garden, Mrs. Irene Vittetoe, Instructor,
Denver Botanic Gardens
- 6) Mr. and Mrs. George P. Caulkins, Jr., 435 Westwood Dr.
- 7) Mr. and Mrs. Philip R. Moore, 350 Franklin St.
- 8) Mr. Jim Mills, Mr. Dale Mathis, 145 Lafayette St.
- 9) Mr. and Mrs. John A. Moore, 315 Marion St.

The price of the tickets will be a Five Dollar Donation to the Denver Botanic Gardens (Tax Deductible). Tickets may be purchased at the Gift Shop, from any Botanic Gardens Guild member, or at any garden on the day of the tour.

Among the features of interest in the gardens chosen this year are a large swimming pool in a casual setting, plants grown in color-coordinated schemes, modern sculpture, large play areas segregated with shrubbery and flowers, terraces which are brick enclosed and used as outside greenhouses in the summer, and a latticed arbor filtering sun over tuberous begonias. Exhibited at the Children's Garden are multiple vegetables and annuals planted in designs landscaped by children.



Fleeta

Daylilies

Harry B. Kuesel
American Hemerocallis Society

Daylilies are rapidly gaining in popularity in Colorado and deservedly so. They are simple to grow, require no pampering, have a long blooming season, and are very disease resistant. Amateur and professional breeders have found them easily crossed to produce new varieties, a fact which explains the rapid improvements being made in this section of the plant kingdom. Daylilies belong to the genus *Hemerocallis*. Derived from the Greek and meaning "beautiful for a day" is the source of the popular name. But don't be fooled — the average flowering stalk or scape has more than 20 flowers, and new buds open daily so that you can have flowers for almost 3 weeks on one variety. Many daylilies have reblooming characteristics so that a month later, they repeat their bloom cycle all over again. Daylilies differ from true lilies in that they do not grow from bulbs, and the flowers are not borne on stems with leaves. They are hardy herbaceous perennials and rapidly form large clumps of attractive green narrow leaved foliage. The flower stalks rise from the low crown of the plant and branch near the top with clusters of lily-like flowers. The flowers range from about 2 inches to over 8 inches in diameter. Each flower is divided into 6

major parts, the inner 3 segments are generally larger and are called petals and the outer 3 are called sepals. Emerging from the center are 6 thin thread-like pollen bearing stamen and the longer style of the pistil.

Daylilies grow best in a medium to heavy loam soil. For a new planting, spade about a foot deep and work in generous amounts of well rotted manure, leaf mold, peat, or compost. This organic matter helps in holding moisture, and stores plant nutrients. A single application of a good complete fertilizer such as 6-10-4 or 5-10-5 in the early spring is beneficial. Apply a shallow handful around each clump. For top performance daylilies should be planted where they get full sunlight most of the day. Many varieties will grow quite well, if they receive only the morning sun and are partially shaded in the afternoon. Some of the deeper colored varieties benefit from partial shade which reduces the fading, wilting or so called burning that sometimes occurs in direct sunlight for a prolonged period. Natural rainfall in most of Colorado is not enough during the bloom season and watering with a soaker hose every 2 or 3 days to a depth of 3 to 4 inches is beneficial.

Daylilies can be divided, or planted successfully in any month when the ground is not frozen, but generally the best results are obtained when planting is done in the late summer or early fall right after the bloom season. It is best to divide the more vigorous varieties every 3 or 4 years, but too frequent divisions or moving should be avoided to assure the best flowers. When dividing, cut back the tops to about 8 inches and plant in a hole larger than the root mass with the base of the foliage about one inch below the surface. A mulch is not essential but is especially beneficial in sunny areas to preserve moisture. In the spring, clear away dead foliage and other debris. Cut back any damaged or diseased foliage any time it becomes apparent. If time permits, pick yesterday's wilted flowers for the sake of appearance. When the flowering season is over, cut off the scapes near ground level to avoid chance seedlings, unless you are propagating for seed.

The modern hybrid daylily is derived principally from 2 species — *Hemerocallis fulva* commonly called the tawny daylily because of its brownish orange flowers, and *H. flava*, also known as the lemon lily for its prominent lemon yellow flowers.

The present daylily plantings at Denver Botanic Gardens were started in the summer of 1972. At that time they were temporarily planted in the rose test garden behind the conservatory. They were moved to the permanent display beds in the spring of 1973 and augmented by donations from Mr. and Mrs. Paul Watts of Armonk, New York; Edna Lankart of Tyler, Texas; Ben Parry of Signal Mountain, Tennessee; Martha



Kathleen Elsie Randall

Rank and Bethel Martin of Greeley, Colorado, Tom Johnson, Mel Alexander, Jack Riley and the writer from the Denver area. Jack Riley is the Regional Vice President of the American Hemerocallis Society for the Rocky Mountain states and is generally recognized as the organizer and founding father of this display garden. All sizes are well represented, ranging from miniatures with flowers under 3 inches in diameter to small flowered types with sizes from 3 to 4½ inches diameter to large flowered varieties. Many varieties such as Fleeta (a fine deep red diploid) and Kathleen Elsie Randall (a creamy melon tetraploid with an orchid midrib) have won Awards of Merit from the American Hemerocallis Society. We urge our members and visitors to come to the Gardens and enjoy this wonderful world of daylilies.

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Ceratonía síliqua

in the
Boettcher Memorial
Conservatory

Peg Hayward

Ceratonía síliqua L. is a tender evergreen tree which grows wild in the countries bordering the Mediterranean Sea. The last ice age, which eliminated most of the native British species as recently as 10,000 years ago, did not have nearly such a disastrous effect on the Mediterranean plants. The carob is the sole survivor of some ancient stock, and belongs in the pea family, *Leguminosae*. Being the only one of its kind in the genus *Ceratonía*, it is somewhat exceptional among the *Leguminosae*, especially in Europe.

The carob has two names in ancient languages. The Greek, *keraunia* or *kerateia*, alludes to the form of the pod which is like a slightly curved horn. The Arabic, *chirnob* or *charub*, means merely pod. The Latins had no special name; they used the Greek expression *síliqua groeca* (Greek pod). There is no known Hebrew name of the species, which is not mentioned in the Old Testament. The New Testament speaks of it by the Greek name in the parable of the prodigal son. It is a tradition of the Christians in the East that St. John the Baptist fed upon the fruit of the carob in the desert, hence came the common name St. John's bread.

Under favorable conditions, the carob tree grows to 40 to 50 feet in its native habitat. The glossy, leathery, pinnate

leaves are up to 1 foot long with 2 to 3 pairs of oval and obtuse leaflets to 4 inches long. Small red flowers are borne in lateral racemes on shoots of the preceding year.

The crop matures in September and October and is most abundant every second year. The fruit, a flattened, leathery pod up to 12 inches long, has only a few small hard seeds, but it is filled with a sweet pulp which contributes most of the food value. When ripe the pods turn brown and begin to fall. Those that fail to fall are easily knocked down with poles. The pods are rich in protein and sugar. A special dehydrated product has been developed as a breakfast food and for other uses. The pods provide a good substitute for chocolate and are used for the manufacture of syrups and different fermented drinks.

Carob is an important forage crop, being eaten by all kinds of stock, besides furnishing considerable sustenance to the poor in times of scarcity. Its pods form one of the principal exports of Palestine, Syria, and the island of Cyprus. The seeds are said to have been the original carat weight of the goldsmiths.

Carob needs a fairly warm climate for satisfactory growth and it succeeds well in semiarid regions. In general, it may be cultivated wherever the orange can be

grown but does not thrive or bear fruit well where there is much humidity. It grows well in a wide variety of soils. Carob is a slow grower, and lives to a great age. Centuries of cultivation have given rise to a large number of varieties, differing in quality of pods, productiveness, and adaptability to various soils.

The carob tree is sometimes grown in the southern United States because it forms a good shade tree. It is a handsome ornamental, looking much like an apple tree, with a dense, symmetrical, broad head.

Propagation is by seeds or budding, but most often by seeds in the United States. Fresh seeds germinate more quickly than those that have been dried. Trees are normally unisexual, so seedlings of both sexes must be planted in close proximity to insure fruiting. Some carob trees are rarely bisexual, and in Europe some of the selected varieties which are grown and propagated by budding or grafting are of this type.

A well established carob tree may be seen in the Boettcher Memorial Conservatory collection.

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Ceratonia siliqua



BUILDING

A NATIVE GARDEN

IN COLORADO SPRINGS

Lucian M. Long

How do you construct a native wild flower garden? That was the question I asked myself one warm day in the fall of 1970. I was taking one last look at the beautiful dahlias, pinks, portulacas, marigolds, snapdragons, and other annuals which represented my contribution to the many displays of the Horticultural Arts Society of Colorado Springs.

I felt a sense of pride that I had been recruited by Fred Goldsby, the 1970 chairman of the grounds committee, to plant and care for the 3,000 square foot annual bed of the Horticultural Arts Society. Little did I realize that I would inherit his position when he became president of the society the next year.

Monument Valley Park is an area of about 165 acres extending nearly 2 miles along the valley of Monument Creek and bordering, on its south end, the downtown area of Colorado Springs. This park is part of a vast system of over 1,500 acres which was donated to the City of Colorado Springs in 1907 by General William J. Palmer, who had founded the city back in 1871. Along with a gift of 480 acres, known as the Garden of the Gods, by the heirs of Charles E. Perkins, Colorado Springs was provided a park system which rivaled in size many of the large cities of the country including Kansas City, Boston, and Chicago. As is so often the case with things which come easy, most of the people of Colorado Springs have not

seen the need to maintain this enviable position.

Fortunately, the founders of the Horticultural Arts Society were spurred on by the spirits of the early pioneers, so they asked for and received permission to assume the maintenance of about an acre of the park at the corner of Mesa Road and Glen Avenue — about one block west of the Fine Arts Center — as a demonstration garden. Although the area is still under the jurisdiction of the Park and Recreation Department, this arrangement has been mutually profitable, and the corner has become one of the show places of the city.

My first reaction when I was introduced to the demonstration garden was that there would be no problem with soil. It was probably like most of the other soil in the Colorado Springs region, rather uniform sandy clay which was definitely too alkaline. That was my first mistake. It was the most heterogeneous combination of poor soils I had ever seen. From time immemorial Monument Creek has placidly meandered down its valley depositing sand and mud depending on the season. Then about every 20 or 30 years it goes on a rampage, leaving a new flood plain with different characteristics.

Most of the history of early Colorado Springs is recorded in the ground of this area. At least as far back as 1890 horse-drawn wagons disposed of their loads of trash and powder ash, from the soft coal

burned by everyone in those days, in the creek bed. When the original Antlers Hotel burned in 1898, the spoiled food and other trash was doused with a chlorine bleach and much of it was dumped in the creek bed immediately under the area designated as a native garden. This area was used as a dump until about 1903 and had acquired a depth of 6 feet. Some nearby areas are 11 feet deep and won't support anything other than a few weeds.

The first efforts to improve the Monument Valley area were made by Dr. B. D. F. Adams in 1886, but it was more than he could do alone. For many years General Palmer had a long cherished idea of providing the city with a series of parks, parkways, and boulevards, and in January, 1904, work was started under his direction to improve the valley. At his own expense he employed a crew of men with one of his engineers, Mr. E. C. van Diest, as superintendent. There were no commercial nurseries at that time so he sent his crew to the mountains to get native trees and shrubs. Now the people of Colorado Springs are fortunate to have a

progression of Colorado blue spruce, ponderosa pines, limber pines, pinyon pines, bristlecone pines, Douglas-firs, white firs, and various junipers along Monument Creek, which are over 75 years old. Many tourists from as far away as New York have heard about these trees and have asked to see them.

On March 29, 1907, General Palmer made a gift of Monument Valley Park with all its improvements and equipment to the city. At the south end, just north of Bijou viaduct, a small tract was set aside for the cultivation of as many varieties as possible of native wild flowering plants and shrubs. This tract was named by General Palmer "The Colorado Wild Garden." Some of the old timers remember flowers in this area, but nothing remains at the present time.

The present location of the native garden was established by members of the Horticultural Arts Society. I am told that a very presentable garden was started by Ruth Ashton Nelson, noted botanist and author of several very fine books on wild flowers. However, she moved to Estes Park and several other



very dedicated members of the society continued it for a while, but poor soil caused its demise. It seems that field bindweed (*Convolvulus arvensis*) and quackgrass (*Agropyron repens*) grew better than the wild flowers. Also there had been a severe flood in 1935 which had wiped out much of the original improvements of General Palmer. Although the WPA had built an effective, although not beautiful, flood control channel along the creek and restored some of the landscaping, Monument Valley Park had lost its original quaint beauty.

And so that was the situation I encountered that fall day in 1970 when I decided something should be done about changing a weed patch into a native garden. I did not know anything about the gallant efforts of the many who came before me or the problems which faced me — I was concerned only with planning a native garden.

First, I held a conference with Fred Goldsby and Henry Cannel. Henry had been a quality nurseryman for many years and had done more than any other one person to establish the demonstration garden. He had also been employed by Spencer Penrose to plant trees to hide a new road on the side of Cheyenne Mountain. Both men agreed that we should proceed with a native garden, but the question arose, "How do we start?"

That conference heralded the beginning of about 4 years of extremely hard physical work, both summer and winter, and frequently it was 10 hours a day, 7 days a week. The only paid help was Jon Lawyer who worked for the city greenhouse and also worked on a part time basis with me on both the general grounds and the native garden. I am sure that I could not have accomplished the heavy construction alone, especially the selection and transport of about 100 tons of lichen-covered granite. As our skill with a crowbar and planks increased we brought in rocks which we

had rejected before as impossible. The only heavy equipment used was provided by the Park and Recreation Department and consisted of a winch, which for 3½ days we used to place some rocks during the early stages of construction. Several of these rocks weighed over a ton each.

Although I had sketched a general plan for the contour of the garden, I found that each day I had to study the progress already made and then imagine similar situations I had seen in nature. Also very important, since this was a public park and there were no fences, I had to watch the pattern set by persons who came to visit the park or to walk their dogs. I had to plan so that it would be easy for them to walk where I wanted them to walk and difficult to tread on delicate flowers. Naturally, many things had to be done over — time and time again. Rocks had to be reasonably secure so that children would not be injured even if they were on places they were not supposed to be.

As the over-all plan of the garden developed it was obvious that it should become a part of existing landscape. There were 4 tremendous Colorado blue spruce (*Picea pungens*) on the north side of the area which had been planted by General Palmer's crew. There were also 2 white firs (*Abies concolor*) which apparently had been planted after the 1935 flood on the south side. All that remained of the original garden were 7 quaking aspens (*Populus tremuloides*) in the center of the area. They had survived because they were planted in a load of gravel which had been dumped there as fill after the flood. They would not have survived if they had been 10 feet further west where there was a layer of mud 3 feet thick, some of the worst ever brought down by Monument Creek. Underneath was another 3 feet of trash.

Since there was no authority available to explain the process of establishing this microcosm, this native island

community, I found it necessary to study native shrubs and plants in their natural environment, only a short distance away. Obviously the best guide was to duplicate as much as possible the soils where they were growing naturally.

Much of the first winter was devoted to digging out the unwanted trash and weeds. Several weeks were required to chop out from the solid clay a network of cottonwood tree roots. As a by-product I have salvaged over 1,000 ancient bottles from the trash and coal ash, dating from before 1890 to about 1900.

As the months went by it became obvious that there were 2 things of utmost importance. First, the soil had to be prepared at least 18 inches deep and should be of special composition for native plants. Second, there must be adequate drainage. Of course anyone who has tried to grow house plants knows there must be almost constant vigilance to see that the plants are thriving under their new environment. Usually I made a practice of planting 2 of the same species, each in different locations, to determine which location was better.

A basic soil mixture for wild flowers is rather easy to prepare from con-

ventional materials. One part top loam, one part sand, and one part Colorado mountain peat provides a basic mixture which may be varied to suit individual plants. Gravel can be used instead of sand, but the soil becomes difficult to spade and therefore to weed. Especially for native orchids a good mixture of rotten wood should be added. The wood helps to provide the natural fungi which are essential to growth of some saprophytes. Of course I do not recommend that the home gardener try to transplant orchids or lilies because of the low probability of success and the rarity of the plants in nature. Columbine should be grown from seed which should be planted in the fall or frozen several times in the freezer before planting.

I was fortunate in having available quantities of wood chips from the Park Department as they cut dead trees. I used these chips as a base under many of the beds at a depth of about one foot. Also I worked into the base many pine needles which had accumulated under the trees.

Naturally at 6,000 feet elevation it is impossible to duplicate exact conditions up to 11,000 feet. No attempt was made to include the alpine tundra plants, mostly because it would be



White Marsh Marigold

almost impossible without damaging the natural tundra and they would not have the same growth characteristics.

Basically I followed the general pattern of the foothills zone from 6,000 to 8,000 feet with mostly sedimentary rocks in the lower end. The montane zone from 8,000 to 9,000 feet including some rounded glacial rocks and lichen-covered granite boulders is located mostly in the middle. The sub-alpine zone from 9,000 to 11,000 feet is represented on the south end with mostly bare, angular granite. Of course many of the plants occur in nature in all of these zones. Also the amount of shade predetermined the location of some of the plants.

Along the south eastern edge of the garden I built a hill on which I favored plants and shrubs of southern Colorado. Originally the plan did not consider any running water, but it became obvious that many of the plants of the mountains require almost constant water, especially those which grow in bogs, so a small supply of water had to be added almost continuously. This practice permitted the addition of 2 small ponds which helped to hold the water.

The normal rainfall at the garden is about 12 inches a year, whereas it is about 21 inches a year where most of the plants grow. Therefore it is very important that additional water be added. Although native plants can survive long periods of drought if their roots are well established, they thrive on ample drenchings at intervals of several days. This is why there must be adequate drainage. If the aspen leaves develop a mildew or slugs appear the watering is too frequent.

With regards to the quaking aspen (*Populus tremuloides*), it does not occur in nature below 7,000 feet at this latitude, and the cut-off is rather sharp.

Therefore they are considered difficult to grow at lower elevations.

So far I have not used any insecticides or fertilizer in the native garden. I was able to control an invasion of aphids on a golden currant with a strong stream of water. Insecticides would have killed the lady-bugs.

The first few years were a challenge to get the plants to grow. Once many of them got started other plants came up from seed in the soil or from small plants in the clump of dirt intended for another plant. With the encouragement of this special soil, many plants spread too rapidly — such as wild strawberries, wild raspberries, tall mertensia, tall cone flower, yarrow, and some wild daisies, and therefore, have to be treated much as weeds would be in a normal garden.

Aside from learning much about our native trees, shrubs, and flowers during the process, I have learned that you can never complete the construction of a native garden. It can too easily become a "wild garden" instead of a "native garden" and must be given that tender loving care we have heard so much about. I hope that I have been able to provide the basics, using rock in a natural way to provide a "rock garden" instead of a "rock pile." For the last couple of years there has been a new species of flower bloom each day on the average during the months of May and June and I hope this can be improved. Certainly many visitors appreciate that it would require driving hundreds of miles to see many of these flowers.

So far as I know this is the largest native garden in the United States which was built from scratch instead of using an area already established. I hope it will be an inspiration to improve our fast disappearing natural areas. Most of all I hope it will be a source of enjoyment and perhaps enlightenment for those who choose to visit it.

Exotics of COLORADO

Russian Thistle

Salsola kali



Helen Marsh Zeiner

Exotic plants are often rare and beautiful, but they may also be common, troublesome weeds. Any plant not native to the area where it is growing is an exotic plant. Exotics growing in Colorado include many ornamentals; plants of commercial importance such as peach, potato, and wheat, many weeds, and some wildflowers which have become so well-established that we think of them as natives.

Russian thistle (*Salsola kali* L.), a common tumbleweed, is an example of a weed which is an exotic plant. It is not a true thistle, but is a member of the goosefoot family, *Chenopodiaceae*, which includes many plants adapted to dry, alkaline areas.

Russian thistle was first reported in the United States in 1874, when it was found growing in flax fields in South Dakota. It had made its way into this

country in flax seed imported from Russia, where it was a troublesome native weed.

The plant found its new habitat very suitable and spread rapidly. It was common enough to be reported as a troublesome weed in the Dakotas in 1888. By 1898 it was reported in all the plains states east of the Rockies from the Gulf of Mexico to Saskatchewan. Today it can be found almost anywhere in the United States where the habitat is suitable.

While it seems certain that the original introduction of the plant was in flax seed imported into the Dakotas, over the years Russian thistle has been accidentally introduced into other parts of the United States, transported as a contaminator in flax and alfalfa seed.

Russian thistle appeared in Colorado very early. Alice Eastwood, in *A Popular*

Flora of Denver, published in May, 1893, listed Russian thistle and said that it could be found along railroad tracks.

In 1906, Rydberg reported Russian thistle near Boulder, Pueblo, Denver, Huerfano Valley, Canon City, Walsenburg, and La Salle.

When Longyear published *Rocky Mountain Wild Flower Studies* in 1909, Russian thistle was important enough that he devoted a chapter to this interesting pest. In this same year Coulter and Nelson's *New Manual of Rocky Mountain Botany* said that Russian thistle was a widely distributed plant.

All succeeding books devoted to Colorado plants include Russian thistle. It was also reported in eastern wildflower manuals as it continued its spread.

How was this plant able to extend its range so rapidly? First, Russian thistle is well-adapted to dry and alkaline soils. Long, subcylindrical fleshy leaves are much reduced in size, so that little water is lost through the leaves. In the center of each reduced leaf is a comparatively large amount of water storage tissue. Saltwort, another common name, is a reflection of the plant's ability to grow in alkaline soils. The genus name *Salsola* is from the Latin *salsus*, salty.

Second, Russian thistle has a most efficient means of seed dispersal. The plant is an annual, much branched and bushy. At the end of the growing season it breaks off easily at the base freeing the entire ball-shaped top. The ball, often as large as a bushel basket, is rolled along by the wind — a tumbleweed. As the plant tumbles along, the

many tiny seeds are scattered. When winds are high, the plants may be carried for miles.

Russian thistle migrated to new locations in a third way. Its much branched structure makes it easily caught and carried on underparts of trains and automobiles. Early reports were from railroad right-of-ways and roadsides.

As Russian thistles blow along, they catch in fences and create masses of tumbleweeds. Blowing soil may be caught by these windbreaks and form dunes which cover fences.

Although Russian thistle is considered a troublesome and even a noxious weed, there is some good to be said for it. Young leaves are soft and succulent. When the plants first come up in the spring and are no more than 4 or 5 inches high, they are a very good potherb. Russian thistle "greens" were an important addition to the vitamin-deficient diet of dryland homesteaders on the plains some 50 to 60 years ago. They also provided food for stock, both as forage and ensilage.

Unfortunately, as the plants mature the leaves become spine-tipped and hard. These stiff spines can cause mechanical injuries to stock. Sometimes these are injuries to the mouth, but other types of mechanical injury such as injury to the feet may also occur.

With building materials almost nonexistent, some homesteaders made crude windbreaks and cattle shelters from dry tumbleweeds massed together.

Today, tumbleweeds have a strictly non-utilitarian use — sprayed white or silver and sprinkled with glitter, they are prized for Christmas decorations.

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The Green Thumb

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THE COVER

Sparmannia africana
African Hemp

THE GREEN THUMB

AUTUMN, 1975

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The Green Thumb

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Co-Editors

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M. WALTER PESMAN

He Made the Native Plants Our Friends

Wes Woodward

In April, 1958 he stood before the delegates to the Fifteenth International Horticultural Congress in Nice, France, and spoke to them on his favorite subject, the flora of the Rocky Mountain region. Tall, handsome, silver-haired and courtly, aristocratic in appearance, speaking with ease and authority, M. Walter Pesman made a strong impression on the world's assembled horticulturists by his appearance, his intimate knowledge of the natives of the Rockies, and by his ability to share his knowledge with others.

He spoke well, you know; clearly, logically, and with a sensitive understanding of his listeners and what they wanted to know. Unexpected and perceptive observations, often humorous and witty, revealed his sharp mind and great good nature.

His ability to convey information, sometimes technical and complex, to others, was evident in Nice. The title of his paper was "Little-known Ornaments from the Land of the Rockies," and he introduced it by saying, "Let us begin by understanding each other more precisely." Then he explained that the land he was speaking of might be referred to "as the intemperate, arid, alkaline plant region."

In this important paper Walter

Pesman gave Europe and the world a thoughtful report on the flora of the Rockies and suggested that some of the plants native to that area might be induced to live and thrive in more humid climates, even in Europe. He identified the plants and singled out those that should be tried elsewhere. "It is," he said, "an almost unexplored field of plant introductions." Then, characteristically, he got started on his introduction of Rocky Mountain plants to the rest of the world by distributing packets of seeds of the Colorado columbine to the delegates.

Reading this paper, which was published in "Advances in Horticultural Science and their Applications" in 1962 and again in *The Green Thumb* in 1963, one is impressed by Walter Pesman's habit of looking forward to the future — a "future-minded man," someone called him. Speaking of the alpine zone conditions found in the Rockies and in Lapland and the Swiss mountains, he said, "It is my conviction that we shall see — in the future — a number of 'cold-houses,' in which alpine conditions can be reproduced to a very high degree."

Walter Pesman presented these facts and ideas in English. The Pergamon Press reprint is in English, French and



Walter Pesman and his children, December 1929

German. If it had been necessary, Walter could have repeated his talk in all these languages, and in several others, for he knew them and could use them well. He had even studied Russian although he found little opportunity to use it.

The Nice appearance was one of Walter Pesman's many contributions to horticultural knowledge and advancement. Perhaps his best known teachings are found in the favorite book of amateur Colorado plant explorers, Pesman's *MEET THE NATIVES*, and in his later work, *MEET FLORA MEXICANA*. Scores of articles in *The Green Thumb* and other publications brought the word to a generation of gardeners. As a lecturer at the Colorado universities he reached many more. As a much-respected landscape architect he left his impress on the entire region.

Who was this valuable man? What was he like and what did he do? Well, let's begin at the beginning. He lived an admirable and productive life.

Michiel Pesman was born in Thesinge, Groningen, The Netherlands, on May 28, 1887. Growing up, he attended high school in The Netherlands. It was a six year stint in which a student went far beyond the American high school cur-

riculum, went half-way through college, as we measure education. After a year of invalidism in Holland due to tuberculosis, he emigrated to the United States and Colorado. When he applied for admittance to Colorado Agricultural College in 1908, his high school credentials gained him admittance as a Junior.

Pesman found that Americans pronounced Michiel in a way that he didn't like; instead of saying "Mi-sheel," as was proper, they said Michael, or Mike, or called him the Irishman from Holland. So he adopted the middle name of Walter which suited him and the Americans both. It became official when he was naturalized as M. Walter Pesman.

At "Aggies" he majored in botany, graduating in 1910 and staying there to teach botany to others.

A strong desire to be doing creative work took the young Walter Pesman from the college to employment with the Chamberlain Landscaping Co. in Denver where he began his career as a landscape architect. Very soon he was making a name for himself as an early advocate of conservation and as an organizer and leader in the affairs of his profession. By 1917 he was secretary of the Denver Society for Ornamental Horticulture and was contributing articles to its publication, *Garden Hints*. And then he was writing for the Colorado State Forestry Association, such varied articles as "A Landscape Architect's Views on Highway Planting," "Stopping Tree Waste — Facts and Needs," "Trees of Boulder, Colorado," and "Almost Anything Can Be Made of Wood." Much of his skill as a writer was due to his sensitivity to the current problems of those for whom he wrote. During these years he was serving on the City of Denver's Planning Commission.

Pesman's professional work and society activities and his writing were making him well known, especially to another Netherlander with similar background and purpose. It was inevitable

that Walter Pesman and S. R. DeBoer would collaborate in landscape planning. The collaboration, well remembered by horticulturists of that time, enhanced the reputations of both. Years later, S. R. DeBoer wrote: "In 1919 Walter Pesman and I opened an office in the Tramway Building. Pesman was in the office most of the time; I continued with my park work for the city." Obviously, Walter Pesman did much of the planning on the partner's private practice jobs.

They were a great pair, these two: DeBoer short and somewhat stolid, Pesman long and lean and quick witted. Says George Kelly: "It was remarkable that this partnership continued as long as it did because their philosophies were so different." One of their projects was a subdivision called Bonnie Brae, bringing the new curved street pattern to the City of Denver. Since DeBoer was often away, including several months in England at this time, Walter Pesman carried the load.

Walter Pesman was married to Anna Elizabeth Hyde, a Denver school teacher, in 1923. A strong personality in her own right and a wise woman, Elizabeth ably supported and en-

couraged Walter for the next forty years. A year after the marriage the DeBoer-Pesman firm broke up. DeBoer said of the parting: "We had a hard time pioneering landscape architecture in a pioneer city. We had work but very little money. Finally, in 1924, Pesman and I separated and he took over our Denver school contract . . . I went on building cities."

Landscape planning was new to the Denver schools. In fact, Walter Pesman was the first "Landscape" the schools ever had. It was the right time for it. New schools, larger than anything seen here before, were being built in all sections of the city, and Walter Pesman, with sparkling enthusiasm and rare energy, planned the grounds for these buildings. His article, "Landscape Architecture in Relation to Building Design," published in the Denver Public Schools Bulletin (October, 1931) describes some of the seventy landscape plans he prepared for the schools. There were plans for the new South, East, and West High Schools, for Lake, Skinner, and Smiley Junior High Schools, and for many others.

One of his first and best known plans was for Byers Junior High where "fall



Working on herbarium specimens, 1940. Left to right: Mrs. Kathryn Kalmbach, Mrs. J. H. Kelsoe, Mrs. Ruth Ashton Nelsen, Dr. Aven Nelsen, Mr. M. Walter Pesman

creates a color scheme of cream, scarlet and blue ...". Of Ebert he said, "Redtwig dogwood in combination with evergreen foliage is used to contrast with cream-colored brick and terra cotta ... winter cheer to the pupils." He seemed to have found his greatest pleasure in his plan for Bryant-Webster where he matched the Indian symbols and designs of the building, suggestive of the Southwest, with a ground development featuring yuccas, a dryland group of junipers and sagebrush, and a clump of evergreens with aspens and white birch.

While Walter Pesman planned and designed, George Kelly, a fitting collaborator, constructed and planted. Says George: "He (Pesman) did some outstanding things such as the botanic garden at South High, and the rock garden at East High. He gave me rather a free hand to do whatever I pleased there and even allowed me to plan some school grounds."

The Great Depression shut down the landscape work for Denver Schools, and in 1933 Walter Pesman transferred his planning talents to the joint projects of the State Highway Department and the Federal government. On these, his work ranged from revegetation of eroding highway slopes to the creation of roadside parks. Kelly says: "At first he had difficulties in getting plans approved in Washington that had native plants in them, for they were unknown back there. Later, when the survival lists were checked, nothing but natives would be approved." Some of these roadside parks still exist, although construction of the Interstate system has left many of them on the byways that once were highways.

Orland Maxson, who came to work for Mr. Pesman in 1936 and drew many of these plans, believes that roadside parks a few miles south of Littleton on Highway 85 and in Glenwood Canyon (there is an elaborate one with a fountain and rock wall) are still seen and appreciated.

The Pesman planning office was then

in a small addition to the Pesman home at 372 South Humboldt Street. Maxson, a draftsman-artist at the time, describes affectionately the small office space with its single drafting board, a desk, and boxes and bundles of plans crowded together. A busy place, but spartan — like Walter Pesman himself.

More than highway plans came out of that office in those years. Mr. Pesman produced the plans for the Memorial Park at Crown Hill Cemetery which included a fountain, a chimes building, and a sprinkler system. He made the landscape plans for Country Club Gardens on Downing Street, just south of Cherry Creek. And there were others — city plans, zoning plans, plans for private homes. Kelly tells this story: "I remember one time some friends had bought a lot in Boulder and built on it, and asked him to come and draw a landscape plan for the place. He was quite excited about the prospect of doing something distinctive, as he knew the location was on a hill and covered with large boulders. When he got there to make the preliminary plans, the folks met him, all smiles. 'We got a bulldozer yesterday and had all the rocks removed and the lot leveled off.' Mr. Pesman took one look and his heart sank and he told them that they did not need him any more, that they had ruined all the individuality of the location and that any nursery salesman could 'do' the place with one of his standard designs."

Perhaps no one could judge Walter Pesman's abilities in his field better than George Kelly who worked for him and was associated with him for close to forty years. And this is what Kelly says: "Mr. Pesman was a real landscape architect in the true sense ... He was an artist and had the ability to survey a given project and come up with a suitable solution. He had the rare individuality which allowed him to plan so many successful places."

Always, in these years and later, Walter Pesman was spreading the word

about nature. He taught classes in landscape architecture, botany and horticulture at Denver, Colorado, and Colorado State Universities, almost continuously. Says Maxson: "There never was a time when he wasn't teaching somewhere, at least once a week, often more than that. He was well educated, had a great vocabulary, loved people. An extrovert, he was never self-conscious, and he had a great sense of humor. The young people who came to hear him loved him."

During all his years in Colorado Walter Pesman had been studying the native plants of the Rockies, traveling constantly in his spare time, with glass and notebook, in search of every variety growing in the region. After their marriage, Mrs. Pesman drove the car, stopped when Walter sighted a plant he hadn't recorded, waited while he examined it, and then made notes while he described it. Back in Denver Orland Maxson drew a picture from Walter's description and the dried remains of the plant. All this grew into the book, **MEET THE NATIVES**.

MEET THE NATIVES was published in Denver in 1942 and immediately became a popular handbook. If you want to know what flowers you see when you hike in the hills or climb the mountains you need **MEET THE NATIVES**. It is a companionable book, making allowance for our ignorance of native plants and leading us, by a simple system of zones, color coding and clear drawings, to the proper identification of over 700 Rocky Mountain plants. It's for amateurs, as Walter said. He began his introduction this way: "Just between you and me — don't buy this book if you know too much. It is not a book for botanists..." Says Richard Henry: "The originality of his mind as well as the accumulation of his learning found its way into his classic little handbook." Perhaps it all might be summed up in the simple words inscribed on a memorial plaque at the Mt. Goliath M.

Walter Pesman Trail: "He made the native plants our friends."

Walter Pesman cared about nature, about his community, and about the people of the whole world, and he was a leader in the organizations that cared about these things. In 1943 he was president of the Colorado State Forestry Association and brought about the consolidation of the forestry, horticulture, gardening and landscaping interests to form the Colorado Forestry and Horticulture Association. He served briefly as its first president and was a member of its Board of Directors, he was instrumental in the merging of the organization with the Denver Botanic Gardens, Inc. and he continued to serve actively as a member of its Board of Trustees.

When, in 1954, George Kelly, the editor of *The Green Thumb*, asked for an editorial committee to aid in his



Landscape Architect for Highways, 1943



Mr. Pesman and his daughter, 1948

work, Walter Pesman immediately assisted in forming the committee and became its chairman. From that time on, for the rest of his life, Pesman worked long and faithfully for the magazine.

As chairman of the committee, he insisted that its members write or find others to write articles needed for *The Green Thumb*, and he became the chief contributor.

Walter Pesman's articles in this magazine, in content and in number, are amazing. He contributed 110 articles to the 25 volumes published from 1944 to 1968, an average of over four articles each year. (Sixteen of those articles were published after his death, stemming from the gift, by Mrs. Pesman, of his unpublished manuscripts to Mrs. Katharine B. Crisp, whom he had chosen to succeed him as chairman.)

He wrote about plants: woody plants, exotics, the nettletree, roses, hawthorns, cacti, evergreens and many more. He wrote about trees and forests, about the

problems of gardening, about landscaping and design, about the odors and colors of flowers, about his beloved native plants, and he wrote, again and again, to promote a botanic garden and an arboretum for Denver. In the first issue of *The Green Thumb* he said that now is the "Proper Time to Start an Arboretum." Later, he asked, "What Are Botanical Gardens For?" In 1954 he told us "What We Need in Our Botanical Garden." There were others, many others. His articles were learned and instructive, accurate and practical, always warmed and enlivened by the wry and happy observation, told, it seemed, with a twinkle in his eye. He once gave instruction on "Getting the Best of a Landscape Architect."

In 1961, while Walter Pesman was acting as editor "pro-tem" of *The Green Thumb*, the Board of Trustees of the Denver Botanic Gardens voted him an "honorarium" for his services. Graciously but firmly he refused any compensation, pointing out a number of reasons, an important one being that he could not allow himself "to be singled out in an achievement to which so many members of the editorial committee contributed." Thinking, no doubt, that his reasons for refusing the honorarium might not seem valid to some, he made a statement that tells us much about this man. "I must," he said, "live my life on principles I have outlined for myself . . . and which I have tried to follow."

For Walter Pesman had principles and he lived by them. There was no deviation for him.

Throughout the history of Colorado Forestry and Horticulture Association and Denver Botanic Gardens Walter Pesman was always doing a large share of the work, was always leading others and seeing that what needed to be done was done. He must be recognized as a founder of both organizations and an unselfish worker, although he never sought credit for his work. In the little

planning office on South Humboldt Street this motto hung over his drawing board: "What a whale of a lot of good we can do in this world if we do not care who gets the credit."

His activities reached beyond the field of horticulture and landscaping. He was a respected member of the City Club and served a term as its president. His active mind and his humanitarian concern found a forum in the Ben Franklin Club of which he was a most distinguished member in distinguished company for 38 years. The 25 papers he read before that group ranged from proposals for legal reform to an analysis of the lot of the deprived one-third of the nation, to a systematic examination, in 1945, of the proposed structure of the new United Nations organization.

Walter Pesman was not just a member of the First Unitarian Church of Denver, he was a dedicated and important member, serving for years on its board of trustees, at times as president. His free mind, independent spirit and humane concern for all people made him as outstanding in his church as he was everywhere else.

His membership in and presidency of the American-Soviet Friendship Council caused him much trouble among people who didn't understand his feeling that the Russians were people just like we are and that he should do something about it. George Kelly says that Pesman "just believed in giving everyone a fair chance in the world" and that he paid a high price for standing by his principles.

Walter Pesman served his friends, his associates and his community selflessly and generously, never for compensation or reward. All who knew him are anxious to tell of his constant and dependable services. Says Kelly: "So many times I have known him to pass up good paying jobs to talk to a garden club or help judge a garden contest." A member of the board of trustees of his church added, "Walter was always there when he was needed, or when something

had to be done." Some examples:

In 1930, it was Walter Pesman and George Kelly who took over the job, almost at the last minute before the opening of the first Central City Opera, of clearing the opera grounds of debris and providing an attractive setting. They obtained a truck load of pine trees from the Forest Service, mounted the trees on Christmas tree standards, and buried the stands in the ground. Overnight a grove of evergreens appeared next to the opera house. The next year Pesman and Kelly obtained a collection of ornamentals — spruces, spiraeas, lilacs and other shrubs from a builder's display house in Denver which was being moved — and transplanted the lot to the opera house grounds, establishing a garden there.

When the City Forester's office published "What Tree is This?" in 1950, Walter Pesman contributed the fine drawings that illustrated it.

In 1954, on Colorado Forestry and Horticulture Association's tenth anniversary, it was Walter Pesman who prepared an anniversary program in the form of a radio skit depicting events in the history and the future of the Association, and it was Walter Pesman and Mrs. Alexander Barbour who produced the program.

Walter's community service activities were encouraged by a happy life at home with Mrs. Pesman and their two children, daughter Josephine and son Gerard. It was a joyous family. As many know, they sent out, each year, hand made Christmas cards featuring Walter's drawings, Mrs. Pesman's charming poetry, and lively accounts of their activities. The Pesmans were thoughtful hosts and comfortable friends. Gerard, a civil engineer, lived in Grand Junction for years and is now in Boulder. Jo, now Josephine Chanaud, also lives in Boulder. There are six grandchildren.

Walter Pesman's landscape planning, his teaching and writing, his dedication to horticulture and conservation and beauty, his wide interest in the affairs of

the world and his concern for all people, especially the unfortunate, continued all his life. By 1955 he knew that he had cancer and that he could not expect many more years. He knew it, but few others did. He continued his activities as before with the same old enthusiasm and good spirit.

In these later years he and Mrs. Pesman traveled several times to Europe to visit his relatives in Holland, to study Italian gardens, or the alpine flora in Switzerland and Austria. It was on one of these trips that he made his address at Nice. And they went to Mexico, year after year. While in Mexico Walter studied the native plants, as he had done in the Rockies, then went to the botany books and Mexican botanists. Out of these studies, again came a memorable book. MEET FLORA MEXICANA was published in 1962 and was greeted with cheers from the plant lovers. Containing 270 drawings by the author, it has been described by Richard Henry as "a treasure-trove of folklore and history, as well as of botanical information." In a review of MEET FLORA MEXICANA in *The Herbarium*, publication of the Royal Botanic Gardens at Kew, England, N. Y. Sandwith wrote:

"... It is a most intelligent and attractive pioneering venture, and nothing better could be imagined as a guide for a first botanical visit to the wonderfully varied flora of this country. Mr. Pesman was one of those delightful people who can inject accurate knowledge into the common reader in an easy but original manner."

Then, as his books became successful, recognition for his accomplishments came to Walter Pesman, almost too late. Denver Botanic Gardens and the U.S. Forest Service established, on Mt. Goliath, a trail where nature lovers could find and identify the native plants Walter had written about. The Board of Trustees of Denver Botanic Gardens named it the M. Walter Pesman Trail "... as an expression of its appreciation

and gratitude for the many years of loyal service Mr. Pesman has given to teaching an appreciation of the natural landscape and to urban landscape beautification."

When a similar trail in the Ladder Creek area near Grand Junction was opened, Barbara J. Hyde made the dedication address in these words: "If Walter Pesman were with us this evening, his tall, gaunt frame would minimize our own. His thatch of white hair would be ruffled in the wind as he fretted at the time we are wasting in congratulating ourselves — time that could be spent in looking and learning, ever learning."

Colorado Nurserymen's Association chose Walter Pesman as its Man of the Year in January, 1963, a posthumous award, for Walter had died in November, 1962.

There is nothing more moving or more characteristic of the man than the words Walter Pesman had written some time before, and which were read after his death, at the memorial service in his church. He wrote:

"Will you forget that this is a farewell and keep your memories fresh with all the wonderful times we have had together? Then this occasion will let you go home with a refreshed feeling, knowing that my life in some ways was a fascinating adventure in which all of you had an important part.

"All the past is prologue; the glorious future is still ahead, and you, I am sure, are doing your share in making it truly worth while for all. Good luck to all of you, my very dear friends and relatives!"

What a strong and courageous man! Few have ever faced life, and death, with such valiance and dignity.

The many tributes to Walter Pesman that have been made and are still being made do more than recognize his accomplishments; they emphasize the unusual quality and fine character of this man. Here are a few:

S. R. DeBoer: "Denver is a better place to live in for the work of Walter Pesman and all must be thankful for it."

Richard Henry: "Absolute and uncompromising integrity ... accountability ... teachableness ... deep humility ... enthusiasm ... conviction that service to one's locality must be matched by an equal concern for the peoples of the world ... these are some of the qualities we would keep of the life we celebrate ..."

Board of Trustees, Denver Botanic

Gardens: "He cannot be replaced but the memory of all that he was: teacher, philosopher, scientist, author and warm human friend, will always be cherished."

Orland Maxson: "He was a wonderful man. He treated me like a son."

George Kelly: "He was a great man, who only a few appreciated. Walter Pesman's influence on Colorado horticulture will last as long as there are gardens in the state or flowers in the mountains ..."

SOURCES OF THIS ARTICLE

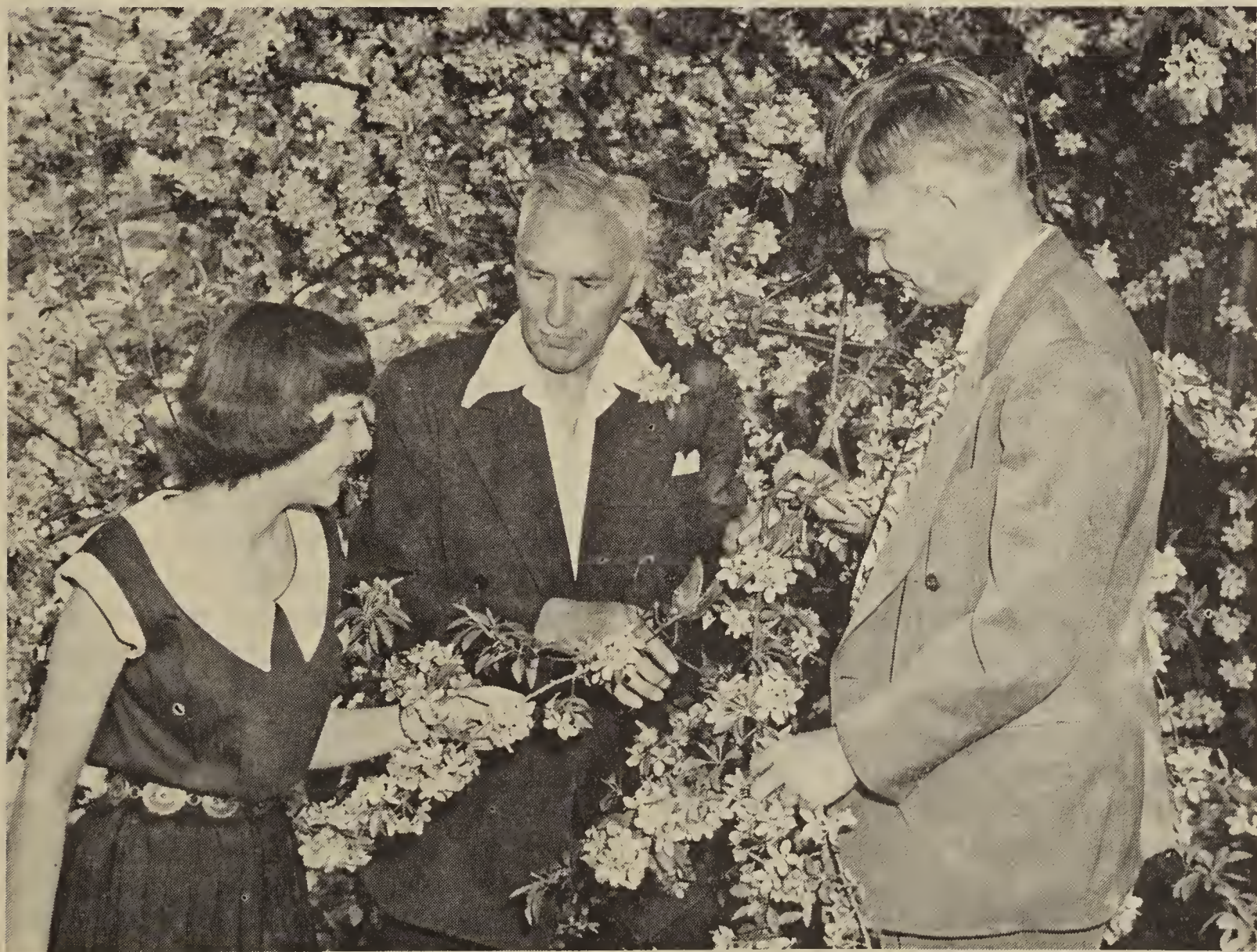
A personal interview with Mrs. Elizabeth Pesman at her home in Boulder, and a brief biography written by her.

Personal interviews with Orland Maxson and the Reverend Richard Henry.

George Kelly's letter to the writer and the manuscript he had prepared for a proposed book on horticultural pioneers.

The publications mentioned and described in the article, furnished by the above, by Bernice Petersen, by the Helen Fowler Library.

Obviously, the writer has only assembled the words and writings of these people, all of whom spoke of Walter Pesman in glowing terms, eager that others might know his story.



Walter Pesman with a pupil and director of C.U. Extension, May 1951

TURFGRASS VARIETIES FOR DRY CONDITIONS

Dave Boyle

*Colorado State University Extension Service
Pitkin County*

With water for domestic use becoming a more valuable resource every day, it is important for us to select and use grasses that require less water. We may do this by choice now, or find that various restrictions will force us to do so in the near future.

For most parts of the state it is doubtful if satisfactory turf for recreational purposes (lawns, parks, golf courses) could be maintained without some supplemental irrigation. However, for areas that get minimal use, there are many turf varieties that will do quite well without additional water once they are established.

There is not a great deal of solid information available on dryland turfgrasses, but research being conducted at C.S.U. by Dr. Jack Butler of the Department of Horticulture and others will give us some good results upon which to base recommendations. The following discussion of varieties is taken in part from a talk given by Dr. Butler at the Annual Rocky Mountain Regional Turfgrass Conference in January, 1975.

Buffalograss (*Buchloe dactyloides*) is a short prairie grass that shows very

good drought tolerance. In fact, too much supplemental irrigation may cause it to be taken over by other grasses. Buffalograss will not do well in shaded areas, nor has it been found very successful at elevations over 6,000 feet. It is a short enough grass that it may not require mowing. It also does quite well with little or no supplemental fertilizer in areas receiving 12 to 14 inches of annual moisture. Observations have shown that buffalograss will withstand traffic well.

Blue grama (*Bouteloua gracilis*) is often associated with buffalograss in semi-arid regions, and is also known to withstand extreme drought. It is a warm-season grass and produces rhizomes that may lead to a relatively dense turf. Blue grama also requires little, if any, supplemental fertilizer under arid conditions. It can be mowed at a height of 2 to 3 inches. Blue grama is easier to propagate from seed than buffalograss, but may require some supplemental water while it is becoming established. Observations have shown Lovington to be a superior variety of blue grama.

Saltgrass (*Distichlis stricta*) grows well on dry sites and will stay green even during long dry periods. It will grow to a height of 4 to 6 inches without mowing. Saltgrass often produces a relatively open turf, but individual plants may produce a dense turf under some conditions. It has excellent wear resistance, and can be found on walkways and playgrounds where other grasses do not exist. Unfortunately, there is no commercial seed source for saltgrass yet. Hopefully, this will be forthcoming in the future, as this is a very promising species.

Bermudagrass (*Cynodon dactylon*) is often found in southeastern Colorado. However, the adaptability of the elite turf types in most of the state is questionable. Bermudagrass offers some possibilities for the warmer parts of Colorado, providing one is willing to accept drawbacks such as its poor color and taller height. A vigorous, coarse bermudagrass grows east of Ft. Collins near Timnath and has proven to be hardy for the last 35 years. This grass has coarse leaves and stems and produces an open, low-density turf. It is easier to propagate than saltgrass and



Bermudagrass

shows exceptionally good drought tolerance.

Wheatgrasses (*Agropyron* sp.), in general, have exceptionally good resistance to drought and are found growing under adverse conditions throughout the state. Although these grasses show little possibility of providing fine, high-density turf, they are valuable along roadsides and other areas for erosion control. The wheatgrasses are frequently found in grass mixtures for droughty areas. Tall wheatgrass (*Agropyron elongatum*) is a coarse bunch grass that grows 3 to 4 feet tall. It has high salt tolerance and will remain fairly green through extended dry periods, especially if mowed fairly high. Western wheatgrass (*Agropyron smithii*), a tough drought resistant rhizomatous grass, is found growing widely throughout the state. It grows at high altitudes and under very dry conditions. It has an attractive bluish-green color. Western wheatgrass has a definite place in mixtures with other dryland grasses, especially buffalograss and blue grama on heavy clay loam soils. It does not produce a dense turf with low cutting (2



Blue Grama



Western Wheatgrass

inches) and frequent waterings. At a 4 to 5 inch mowing height, and infrequent watering, this grass can provide a strong, drought resistant turf of fair density. Quackgrass (*Agropyron repens*) is a rhizomatous grass that can develop a strong sod that will remain green through dry periods. It retains good density under both high and low levels of maintenance. Although it is classified as a restricted noxious weed in Colorado at the present, it has great potential as a turfgrass. As laws and attitudes change, this species may become very valuable. Crested wheatgrass (*Agropyron cristatum* and *Agropyron desertorum*) has very good drought tolerance. It does turn straw colored in the heat of summer, but is green in the spring and fall. It also produces a rather bunchy growth habit, so is not as attractive as the rhizomatous species.

Smooth brome (*Bromus inermis*) is a coarse, strongly rhizomatous grass introduced from Europe, and is now common throughout the state. It can be found growing under very dry conditions and at high altitudes. It remains green through extended dry periods. Some 1,500 individual plants are being screened at C.S.U. for better turf types.

Tall fescue (*Festuca arundinacea*) shows good drought tolerance, although it appears to be confined to irrigated areas along the Front Range. With deep, but infrequent irrigation, it remains green through most of the growing season. This grass should have more of a niche in the area than it now enjoys.

Kentucky bluegrass (*Poa pratensis*) is generally considered to be a water waster, but is found growing in certain areas of the state with 12 inches of precipitation and no irrigation. Often it will go dormant during prolonged dry periods, but individual plants have been found that remain green during these dry spells. In 1974, some 200 bluegrass selections were made from semi-arid parts of the state and are being studied at C.S.U. for further evaluation under dry conditions.

It is evident from this discussion that there are several grasses exhibiting drought tolerance for Colorado. However, many will not give the manicured appearance that we have become accustomed to. As water use becomes restricted and attitudes change, many of these grasses will become more popular. There is an exciting challenge to find and improve upon grasses adapted to dry conditions.

A DENVER BOTANIC GARDENS MEMBERSHIP
Makes the Ideal Gift

SCOTCH PINE AND MOUNTAIN PINE BEETLES



WILLIAM F. McCAMBRIDGE

Entomologist

Rocky Mountain Forest and Research Station

USDA Forest Service

Scotch pine is not a good choice for ornamental planting near the ponderosa pine covered Colorado Front Range, where the mountain pine beetle periodically develops into epidemic proportions. When this happens, large numbers of beetles can fly from the forest to the cities along the Front Range, and with astonishing accuracy are able to find, attack, and sometimes kill Scotch pines, bypassing nearby ponderosa pines.

Beetles flying into Fort Collins during 1972 and 1973 from large infestations 7 miles or more to the west (or less likely, brought into town in infested firewood), were able to attack 15 of the 17 Scotch pines scattered throughout the city which were 8.5 inches in diameter (at breast height) and larger. Some of these

infested trees are up to one mile from other Scotch pines. Suitably large ponderosa pines scattered throughout the same area were totally void of beetle attacks. All 10 of the Scotch pines planted along fairways of a golf course were attacked, and 4 contained brood. Adjacent ponderosa and Austrian pines were not attacked.

Mountain pine beetle attacks on trees not previously considered hosts, and apparently preferred over native hosts, were reported by Furniss and Schenk (1969) from Moscow, Idaho. Beetle preference for Scotch pine and other exotics appears so widespread that, in those areas where epidemics can develop, alternate tree planting choices should be considered.

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DENVER'S

COMMUNITY

GARDENS

Will They Bring Us Together?

Nancy Good

"You see," said the young man in a gentle voice, "we see these gardens as much more than just supplementing the diets of poor people in Denver. These gardens can bring the community together and from this small beginning we can work together to solve more complex problems in our society."

It is a young student of organic gardening speaking, a member of a class taught by Jim Fowler, a senior citizen who has volunteered his time for six years to teach gardening at the Free University. This class, together with over 50 youthful members of the Divine Light Organization, form the backbone of Denver's Community Garden Project initiated by Mayor Bill McNichols this spring after a successful pilot project the summer before, called the Mayor's Senior Citizens Vegetable Garden Project.

Once announced, the Community Garden Project caught the imaginations of the young people. "Have you heard? The Mayor is plowing up all the vacant lots owned by the city for vegetable gardens. Far out!" Notices were tacked on bulletin boards of colleges and natural food stores calling all interested people to join the weekly planning meeting held every Tuesday evening with Jim Fowler and me, all of us sitting on the small chairs of the Unitarian Sunday School room in the Youth Hostel house. Every week new faces appeared, some young, some old. And every week the project grew in geometric proportions.

Plans were made for a garden at Laradon Hall and Galaxie Nursing Home and permission was asked for a garden with inmates at the County Jail. The next week it was decided to build a solar greenhouse to grow vegetables in winter as well as summer, and to demonstrate the use of solar energy. Next came the idea for the creative use of small city lots for mini-parks with playground equipment, picnic tables, and a community vegetable garden. Some of the youth engaged in working on the food drive to replenish the food banks suggested we must plant some large fields with vegetables that could be preserved and donated to the banks. Could the city be persuaded to provide five or ten year leases on the land? Could we persuade civic or service organizations to provide funding for the additional tools needed, if not the \$500 needed for the greenhouse? We decided to go back to the Police Protective Association which had funded the Senior Gardens; to Gates Rubber which had provided hoses; to King Soopers which had provided seeds at cost; and then to seek out friends who belonged to service clubs to ask for donations.

Ed Sullivan, coordinating the Project for the Mayor's office, had the wisdom to let the young people sit in on the planning meetings of city officials from the beginning. The officials, though their departments were understaffed due to the hiring freeze, rose to the occasion. Dr. William Gambill, Director of the Botanic Gardens, somehow managed to free staff to plow up the lots. Herb Gundell inspected the new sites. Gene Lewan of Public Works sent his trucks to pick up rubble and to haul in manure. Joe Raus of the Youth Commission



Ed Hammargren, Williams St. Garden

contacted youth organizations for help. Ken Dybevik of General Services checked out the ownership of lots. Ray Buckles of Denver Opportunity contacted the Action Centers which saw the gardens as an opportunity to enlarge their contact with the community.

The phones of the Commission on Aging where we were coordinating the beginning of the project rang with requests for help in starting gardens. Enthusiastic Principal Ollie Barefield of Whittier Elementary School was elated to know she could get some help with a vegetable garden project and mini-park. Whereas one nursing home pioneered last year with a vegetable garden, this year there were ten who wanted to give it a try.

Offers of help poured in. Bob Todd, a CSU senior, a veteran of the Senior Project, offered to come from Fort Collins with friends and plows to help. He also wanted to try out a school research project, building gardens for people in wheelchairs. Wyman School kids saved their milk cartons so that seniors at Gaylord Senior Center could use them for planting seedlings. Cheryl Wentworth, of the Eastside Social Service Office, wanted to start gardens for young and old in the area around 29th and Curtis. A woman on welfare wished to help the kids in the apartment houses near her start a vegetable garden. Neighbors on some blocks call in to see if the lot they have found belongs to the city. Some private owners offered their lots. A man called in to offer two loads of scrap lumber for building greenhouses. The Extension offices set up a Master Gardener program to train skilled gardeners who would agree to donate 36 hours assisting other gardeners, and some of these Master Gardeners offered their services.



Young People Preparing Garden at 1330 High St.



Yeola Ranes, Campbell Stone Residence

Last summer 180 young people from the Youth for Christ-Campus Life Organization devoted a Saturday to spading up backyards of seniors and digging up the larger lots. This year, a Day of Work was planned for May 3, when young people from all over the city assisted elderly and handicapped gardeners with the heavier digging. At the end of the day, there was a pot-luck supper followed by a square dance with elders teaching their younger helpers and young people swinging their elders. Rod Whitlock, Director of Parks and Recreations Senior Centers called, and an old timers' kitchen band played for supper, and a youthful ensemble played for dancing.

In the meantime, weekend work projects, planned by the young people, go on in many communities. At each site they involve as many in the community as possible. At one site, the neighbors included members of the Holy Order of Mans; the Institute of Cultural Affairs; the Wyman School; a home for delinquents; a half-way house; the Park Manor Nursing Home; the World Welfare Association; the Indian Center; Gaylord Senior Center; and a couple of city officials. So far the Community Gardens of Denver have brought more of us together than we knew existed!

Exotics of COLORADO

Staghorn Sumac

Rhus typhina

Helen Marsh Zeiner

For brilliant autumn color, few shrubs can rival staghorn sumac, *Rhus typhina* L., with its beautiful scarlet red leaves shading into crimson, purple, and orange. In addition to its striking fall color, staghorn sumac has other attributes that make it useful as an ornamental. It is a tall, almost tree-like shrub with large, pinnately compound frond-like leaves sometimes described as giving a tropical effect. Twigs of staghorn sumac are thick and densely covered with velvety hairs, resembling a stag's horns in the velvet and giving the shrub its common name.

The small greenish flowers are borne in dense, pyramidal panicles. They are followed by dense clusters (6 to 8 inches long and 2 to 3 inches wide) of small dry fruits covered with crimson red hairs. The fruits hang on all winter and are quite ornamental. They also attract birds who feed on them during the winter and spring. The hairs on the fruits are interesting because they contain an acid. The fruits can be used to make a pleasantly tart drink due to the acidic hairs. Indians used the fruits in this way, and early pioneers moving

into the midwest and living off the land enjoyed sumac "lemonade."

The bark, particularly that of the roots, has long been used as a source of tannin. The leaves are also rich in tannin. The wood is orange colored, soft, and coarse grained. It can be used for turning out small objects such as candlesticks. Young shoots have a large, soft central pith. When this pith was removed, they made very good pipes for drawing off the sap of sugar maples.

The late Dr. A. C. Hildreth, Director Emeritus of Denver Botanic Gardens and a nationally recognized authority on plants for dry areas, considered staghorn sumac as one of our most dependable shrubs, thoroughly adapted to our conditions, easily grown, and usually available in the nursery trade.

The worst fault of a staghorn sumac (which it shares with other sumacs) is its habit of sending up suckers from the roots. These must be removed unless you want a thicket of sumac. However, this habit has made sumac useful in covering bare areas, such as road cuts and steep slopes.

Rhus typhina occurs naturally from

eastern Quebec to Ontario, southward to Georgia, Indiana, and Iowa. It is cultivated as an ornamental in the United States but is much more popular as an ornamental in Europe. It has been said that if sumacs were rarer in the United States we would prize them more highly. Another sumac often cultivated is *Rhus glabra* L., smooth sumac, native to Colorado as well as to many other parts of the United States. It is a small to medium shrub valued for its autumn color. *Rhus typhina laciniata* (Wood) Rehder is a cut-leaved variety of staghorn sumac grown for its very decorative leaves. It is a medium tall spreading shrub.

Staghorn sumac is a member of the cashew or sumac family, *Anacardiaceae*, and it has some interesting relatives. The

cashew nut (*Anacardium occidentale* L.) of tropical America and the pistachio nut (*Pistacia vera* L.) of the Mediterranean region are both members of the cashew or sumac family. So is the mango (*Mangifera indica* L.), a native of Asia but cultivated widely in the tropics for its edible fruits.

Poison ivy (*Rhus radicans* L.) is a beautiful but troublesome member of the same genus to which staghorn sumac belongs. This plant is extremely poisonous to some people who can be affected merely by touching any part of the plant.

Among the ornamentals in this family are the smoke trees: *Rhus cotinoides* Nutt. (*Cotinus americanus* Nutt.) of the south, and *Rhus cotinus* L. (*Cotinus coggygia* Scop.) of Europe and Asia.

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Staghorn Sumac

My Garden

Julia Andrews-Jones

American Society of Landscape Architects

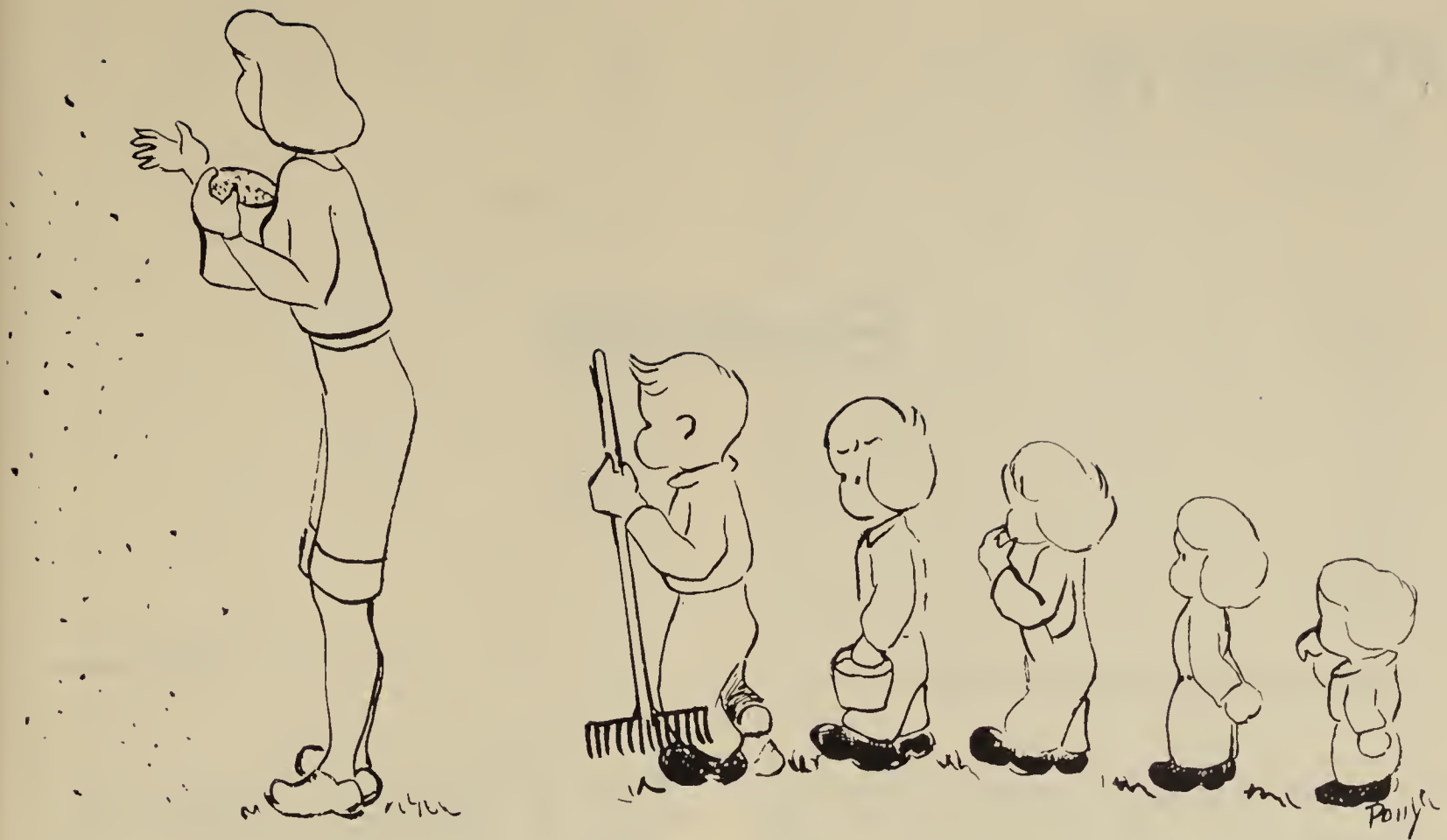
My garden is a wild site at an altitude of 7,650 feet. This fact, I feel, makes a whole new set of rules necessary for planning a garden. Also, the act of cultivating plants further deviates from established methods because gardening doesn't get top priority on my time schedule. In my garden, plants have to stand their ground when ten small people's feet pound across. So, at this time, I am establishing ground covers on the land disturbed by construction of our home.

I approach gardening with much gentle persuasion as we have an excellent and lush cover of grasses and wild flowers, ponderosa pine and choke cherries over most of our land. It is a "move over, I want in" way of planting on small areas of disturbed soil, such as gopher mounds, in order to combat the cheat grass (*Bromus tectorum*) that will inevitably grow. I scratch the area with a cultivating rake, cast blue grama grass (*Bouteloua gracilis*) seed by hand, and lightly rake in. The key to successful germination is to do it as the clouds

build up for one of those wet spring snows. In one area I sowed blue grama seed and there was no spring moisture to bring it up. The next year I sowed smooth brome (*Bromus inermis*) on the previous year's failure. The third spring they both came up with the brome eventually winning the ground to my disappointment. When the brome becomes sod bound there is too much open soil that is continually eroded by the wind. For that reason I have discontinued seeding brome, even though it has a higher percentage of germination and grows faster than the blue grama and buffalo grass.

I tried the same system of seeding side oat grama (*Bouteloua curtipendula*) and buffalo grass (*Buchloe dactyloides*) on the disturbed soil of the leaching field area. The side oat grama came up well the first year but the grama is going out and the kentucky blue grasses from surrounding sod are coming in.

Around the residence my most successful method of establishing ground cover has been "plugging it." When



desirable grasses grow in the vegetable garden or among the perennials I transplant it. Five children create a lot of wear on ground cover and this method will stand some of it. The serious drawback is the slowness of complete cover. My vegetable garden isn't producing much grass these days! I get very impatient so in August I seed areas of grass small enough that I can "mother hen" through the fall. By spring it has

to be on its own. These patches have to be brought up with water because in August the ground is dry, dry, dry!

As I look up the hill at the carpet of blue *Penstemon unilateralis* and gold *Sedum stenopetalum* in late June. I wonder if grasses are the only ground cover that will stand up to ten busy feet. Next spring instead of seeding grass west of the house maybe I'll try plugging penstemon and sedum.

Gifts and Bequests

Lifetime and testamentary gifts to the Denver Botanic Gardens are deductible in computing both income and death taxes. The Trustees ask anyone who wishes to add to the Gardens' limited resources to consider making a gift of either real or personal property during life, or a bequest or devise by will. Such disposition can be made specifically either for the Development Fund or the Endowment Fund or both. The proper designation of the recipient is *The Denver Botanic Gardens, Inc., a Colorado Corporation.*

FORM for GIFT or BEQUEST

I hereby give ☐ bequeath ☐ to The Denver Botanic Gardens, Inc., a Colorado Corporation, a non-profit, educational institution, the following:

Endowment Fund, Amount: _____ Development Fund, Amount: _____
to be applied for the purposes of The Denver Botanic Gardens.

Name _____

Address _____

Signature _____ Phone _____

Bambusa

in the

Boettcher Memorial Conservatory

Peg Hayward

Bamboo is not only one of the most unique plants that exist but it is also one of the most universally useful plants known to man. For over half the human race, life would be completely different without it. Bamboo is distinguished by the special structure of its stem or culm, its rapid rate of growth, reaching its full height in a short period of time, and its strange flowering habits.

There are 23 genera and over 200 spp. of mostly woody perennials belonging to the subfamily *Bambuseae*, the most primitive tribe of the *Gramineae* (grass family). The genera *Arundinaria*, *Phyllostachys*, *Bambusa* and *Dendrocalamus* contain the most important species in cultivation.

Geographical distribution of bamboo is uneven in the tropics, subtropics and mild temperate regions of the world, from sea level to the snow line. The greatest number of species are found in the Indo-Malaysian region. The plants flourish in climates which are warm all the year. In all types of bamboo, the most striking characteristic is immense vitality, seeming to overcome almost any kind of hardship.

Bamboos are distinct from other grasses because of their woody stems. Large bamboos seem more like trees than grasses, but their stems are smooth, hollow, and jointed like grass stems. The

largest species have culms of 8 to 12 inches in diameter and may attain a height of 100 to 120 feet.

Bamboo has a large growth below ground, the rhizome. This is a long and fast-growing underground shoot from which germinate the new sprouts. It is the speed with which the rhizome travels underground that accounts for the spacing of the culms, each of which possesses its own system of small roots. The rhizomes fall into two distinct classes. In one type the rhizome is short, and more or less vertical or slightly oblique, and sends up numerous culms forming dense clumps. In the other type, the rhizome is horizontal and travels for a greater or less distance, at varying depths in the soil, producing more widely-spaced aerial culms.

Bamboo shoots usually reach their full height before sending out side branches. This usually occurs in less than a year; the rate of growth is phenomenal. The culms branch freely, sometimes from all the nodes, sometimes only from the upper, leaving the lower part of the culms bare. The leaf-sheath is commonly fringed, while the leaf blade is flat, many nerved, articulated with the sheath, and usually short-petioled.

Bamboos vary in their manner of flowering. Some have spikelets borne in

terminal panicles on leafy branches. In others, special culms shed their leaves and produce special flowering culms, while other culms remain leafy. In others, especially the larger forms, after a lapse of several years all the culms lose their leaves and produce flowers. In such species it is remarkable to find that all the clumps in a particular region flower simultaneously. The interval between flowering is not always a very regular one, and varies in length for different species. When all the culms flower simultaneously, the rhizomes are weakened and for sometime afterwards produce only weak slender stems, slowly regaining the power of forming culms of normal size. Sometimes, exhausted by their flowering, the plants die and regeneration then takes place only from seed.

The economic uses of these giant grasses are almost endless. As objects of grace and beauty in the garden or con-

servatory, bamboos are matchless. In the tropics bamboo is used to construct huts, rafts and bridges. They are often used for water pipes and drainpipes. Some of the smaller stems are made into flutes and other wind instruments. In China large quantities are used for furniture, screens, toys, tools, cooking utensils, fishing poles, fans and many other useful items. The young shoots of some kinds of bamboo are eaten pickled, preserved in sugar, or cooked like asparagus. These bamboo sprouts are imported into the United States for use in chop suey and other Chinese foods. Bamboo, having a high cellulose content, is well suited for making paper and also rayon. The world's yearly growth of this interesting plant is greater than 10,000,000 tons, of which the greater part comes from the East.

Several species of bamboo are included in the Boettcher Memorial Conservatory collection of plants.

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Bambusa





George Cramner

Virginia Shaw

The Denver Botanic Gardens wishes to pay tribute to the dynamic Denverite, George Cramner, who died last May at the age of 91. Recalling Mr. Cramner's amazing vitality, Mr. Alan Fisher tells how his friend loved hats, enjoyed Spain, Spanish wines and women, and hated cars and the ugly exteriors of gas stations. Happily too, Mr. Cramner had opinions concerning the improvement of Denver; and these he put into action from the beginning of his career as manager of parks and improvements during the administration of Mayor Ben F. Stapleton from 1935-1947.

During the Depression, Mr. Cramner directed the excavation of Red Rocks Amphitheater, which is considered to have the finest acoustics of any outdoor theater in the world. He used an amphitheater he had seen on an island off the Peloponnesos as a model for the Red Rocks theater.

To better connect Denver with the mountains, the West 6th Avenue and West Alameda highways were developed under Cramner's direction. The development of the Valley Highway was also Mr. Cramner's idea, and the right-of-way for it was acquired by his taking tax delinquent property.

The development of Winter Park and its facilities for skiers was another realization of Mr. Cramner's ideas to use Colorado's natural resources.

Then, with PWA federal funds, Mr. Cramner saw to the building of a three-mile water tunnel under Jones Pass and a compensating reservoir near Parshall.

Stapleton International Airport was perhaps one of the largest feats that Mr. Cramner accomplished: at no cost to the city, he acquired the 2,000 acres of land that is now used as a transportation center.

"He was," Mr. Alan Fisher says with a smile, "reactionary in many ways . . . One afternoon we were driving along 16th Street near Golden where he wanted to inspect the viaduct. He was unhappy about the gravel used for aggregate in the city because it contained silt that would cause decomposition. Suddenly he stopped the car and walked about a hundred feet from it. I watched the traffic pile up. "Hey!" I said, "We'll get thrown in jail." "What better place to discuss the city's gravel?" he answered.

Mr. Cramner, in an address to the American Institute of Architects, said he hoped curves and arches would not be forgotten.

And what about gas stations? Mr. Cramner believed that they could at least be landscaped.

A man with such ideas must be appreciated.

Books on House Plants in The Helen Fowler Library

Solange Huggins

In October 1974 members of the Greenhouse and Library staffs initiated a new program termed the "House Plant Clinic." Twice weekly, staff members answer telephone inquiries regarding problems with plants, or inspect plants brought to the Gardens and offer advice. The service has been popular and continues to provide information every Tuesday and Thursday afternoon from 1 p.m. to 3 p.m.

The Greenhouse and Library staffs are involved in finding information requested by the patrons. Although experience provides many answers to the questions, the Helen Fowler Library collection serves as the core of back-up information.

No one book provides all information one may want to know about house plants, but some references are preferred by the staff over others. Among these is *Exotica 3*, which is the best pictorial guide for identification. The illustrated portion is arranged in alphabetical order by families of tropical plants. This takes up the largest portion of the book. The next part deals with descriptive informa-

tion arranged by generic names of plants with a letter and number key to which one must refer in order to find the cultural information. *Exotica 3* has an excellent index of common names, a very useful portion of the work. Here the index is not complete; no index could be, considering the provincial nature of such names. The botanic name index, genus followed by species, makes up the last part of the book. *Exotica 3* is not necessarily the best reference tool for the amateur house plant grower since the price of \$72.00 is prohibitive. Unless one has an extremely large collection of plants, the smaller *Exotic Plant Manual* at \$37.50 is not only more reasonable but also more useful in that each illustration shows the culture key.

The *Royal Horticultural Society Encyclopedia of Gardening* is a very useful tool in four volumes. This work describes almost all plants suitable for culture in temperate climates plus many tropical and subtropical species. Each genus has a general account followed by descriptions of individual species and widely known hybrids. In addition there

are many general articles on garden techniques and definitions of horticultural and botanical terms. An addendum has been published which is on order at the Library.

Two much smaller works are *The Pocket Encyclopedia of Indoor Plants* by Age Nicolaisen and *200 House Plants in Color* by G. Kromdijk. These two volumes are more compact and the illustrations in both are totally in color. The format differs between the two, with the text by Nicolaisen having all the illustrations in the first part of the book, and each plant is assigned a number to which one refers in order to find the cultural information. The text by Kromdijk has the picture and the culture on the same page. Neither is complete nor do they necessarily complement each other but both are very useful. If one were to add the two volumes *Flowering House Plants* and *Foliage House Plants* by James Underwood Crocket in the *Time-Life Encyclopedia of Gardening*, one's collection of

reference tools would be quite sufficient to meet most needs.

All cultural information must be tempered to our Colorado climate where altitude does make a difference. It is difficult to maintain greenhouse conditions in our homes. The dryness of the air and the brilliance of the light are conditions which have to be watched. When a book says not to water a jade plant all winter long, the plant may survive in the northeast but it will die here. Also full sun, a southern or western exposure in the summer months, will cause brilliant colors to emerge in coleus followed by brown scorch.

House plant culture can be successful in Colorado as elsewhere, especially if one uses common sense along with the advice from experts and from books. The Boston fern which would really be beautiful in the western window of the living room may soon have to be replaced by an *Asparagus plumosa* kept a distance away from the window. Constant struggling is not necessary, there are geraniums, cacti, and some succulents which thrive in the sun and those marvelous philodendrons and aglaonemas which will do nicely in the northern windows.

Books on house plants make up the largest collection on one subject in the Library. These same books also account for the largest circulation at any time of the year. The many beautiful books published on the subject of house plants have different approaches.

Some books deal with the use of plants as decorations in the home; some with using the best plants for every exposure; some with the use of water as a growing medium. There are also monographs on particular house plants such as geraniums, cacti, succulents, and many more.

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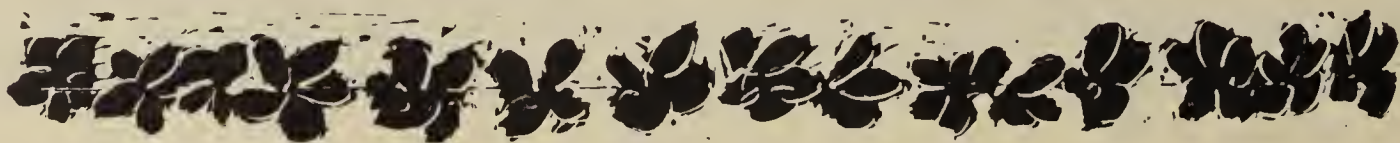
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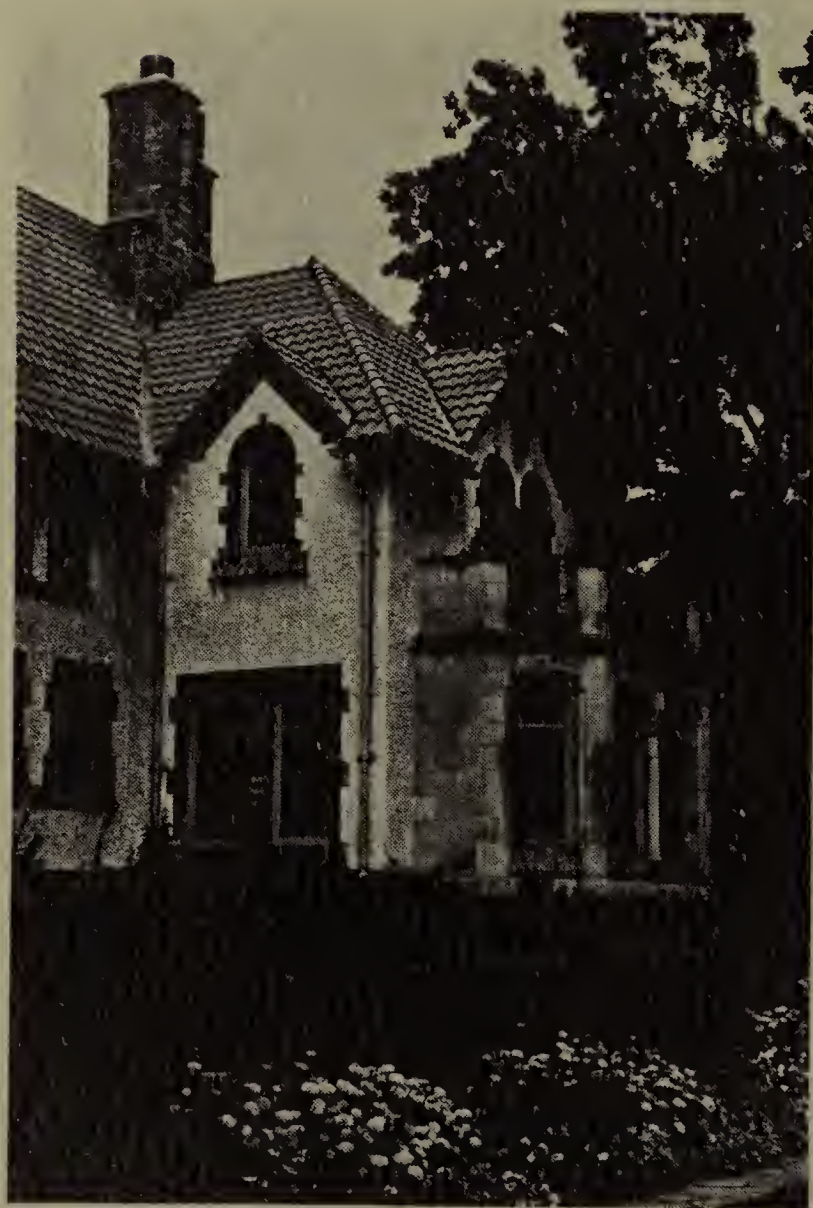
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The Green Thumb

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WINTER, 1975



THE COVER

Parry's Primrose

Primula parryi

THE GREEN THUMB

WINTER, 1975

VOL. THIRTY-TWO, NUMBER FOUR

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The Green Thumb

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PATRICIA G. SMITH, Ph.D.

Editor

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*Bitterroot (Lewisia rediviva),
above, and Parry's gentian
(Gentiana parryi), right,
bear the names of early
Colorado botanists.*



Early Colorado Botanists

(once over lightly)

Berta Anderson

Botany came to Colorado long before statehood, even before it was a Territory in its own right but just a part of Kansas.

After the 1803 Louisiana Purchase of the territory west of the Mississippi to the Rocky Mountains, expeditions of exploration were organized as soon as possible. As examination of the new area spread west, so did the knowledge of its plants. Following in the tracks of the expeditions, often with them, came the botanists, zoologists, and geologists. All of these specialties were often combined in one person in those early days, traveling under the guise of naturalist.

Zebulon Pike blazed the trail into Colorado and New Mexico in 1806 under orders of the War Department to explore the internal parts of Louisiana. He was to attempt to make peace between the Osage and Kansas Indians, make contact with the Comanches, explore the headwaters of the Arkansas River, find the source of the Red River, and in addition collect natural history specimens.

The group did not reach the upper Arkansas until late in the fall. After following the stream into the hills as far as present Leadville, they returned south and struggled through heavy snow into the San Luis Valley. There they built a stockade on the Rio Grande thinking that they were on the Red River, and there they were captured by a patrol of Spaniards for being in Spanish territory. They were taken to Santa Fe and later to Mexico. However, they were well treated and released the next spring to return to Natchetoches which they reached just a year from the time of leaving. Needless to say, Pike had no time for natural history collections in the Colorado area.

At this time Meriwether Lewis and William Clark were finishing their famous expedition across the northern reaches of the new land. Lewis was enough of a naturalist to make plant, bird, and animal collections. While these collections suffered from the vicissitudes of the expedition, Lewis did manage to bring back to President Thomas Jefferson 155 specimens of plants new to science. Among these was the bitterroot, now the state flower of Montana, which is his namesake, *Lewisia rediviva*.

The Lewis plants were described and named by Frederick Pursh, a German gardener who came to the United States in 1799. He worked in

gardens in Baltimore and New York and was with Dr. Benjamin Smith Barton, professor of medicine at the University of Pennsylvania in Philadelphia, when the Lewis plants reached there. Barton had been selected by Jefferson to describe the plants to be brought back by the expedition, but he kept procrastinating, working on a *Flora* of the eastern states instead. Pursh soon left him and went to work for Bernard McMahon, who had a large garden near Philadelphia. The Lewis specimens were later given to McMahon who had Pursh work on them. Finally, Pursh went to England taking the plants, apparently without permission from anyone. In 1814, he published *Flora Americanae Septentrionalis*, the first *Flora* of North America to be written, in which he described and named the new plants from the northwest. The story of how the specimens were finally returned home to the Herbarium of the Philadelphia Academy of Science is too long to recount here.

The first trained botanist to reach Colorado was the surgeon with the Stephen H. Long expedition of 1820, Dr. Edwin James. While he had qualified as a physician, James' heart wasn't in medicine but in plants, and he was delighted with the many new ones that he found in the area that was to become Colorado. He is credited with discovering and naming the lovely blue columbine, *Aquilegia caerulea*, and he collected many new alpine plants when he made the first recorded ascent of Pikes Peak. These he sent to his friend and colleague in New York, Dr. John Torrey, who named several for their discoverer. Among these are snow lover (*Chionophila jamesii*), purple saxifrage (*Telesonix jamesii*), and the genus *Jamesia*. The Colorado representative of this genus is a shrub with waxy white blossoms known as wax flower or mountain mock orange. In the fall its leaves turn a lovely velvety maroon color.

John Charles Fremont made several expeditions to the west, beginning in 1846. He was his own naturalist and while many of his collections didn't survive, some did and were described and named by Torrey and his protege, Dr. Asa Gray. Of these we have several in



James' saxifrage (Telesonix jamesii) takes part of its name from the physician of the Long expedition.

Colorado, among them the rock senecio of high altitudes, *Senecio fremontii*.

Augustus Fendler, tanner turned plant collector, was also collecting in the west at this time. He obtained permission to go with the expedition of the U.S. Army under Lieut. James William Abert that took possession of Santa Fe in 1846, and spent most of the following year in New Mexico. Though he didn't collect in Colorado, many of the plants in the southern part of the state are common to both states, and so his collections were significant for Colorado. A beautiful white-flowered shrub of the red sandstone cliffs is his namesake — Fendlerbush, *Fendlera rupicola*. *Senecio fendleri* is a common herb of the eastern slope.

Charles Christopher Parry, another doctor turned botanist, spent every summer in Colorado territory from 1861 to 1865, making extensive collections which he sent to Dr. Asa Gray, by now at Harvard University and the arbiter of American botany — as Linnaeus had been of European botany a century before. Later, Parry sent his collections to and worked with Dr. George Engelmann in St. Louis. Together they named many of the western plants, so that we have plants named *parryi* by Engelmann and plants named *engelmannii* by Parry. Among these are some of our most well-known wild flowers and trees. The Engelmann spruce *Picea engelmannii*, is known to all of us, and among the plants named for Parry the blue gentian, *Gentiana parryi*, and the beautiful rosy subalpine primrose, *Primula parryi*, are perhaps the best known, though there are many more.

By 1876 many expeditions of exploration and survey had pretty well covered the west, Colorado included. Among these were army surveys, railroad surveys, and Hayden's geological surveys which were of most importance to Colorado. All of these expeditions carried botanists and naturalists and so added to the growing knowledge of western flora. Thomas Nuttall with Wyeth (1834), John Milton Bigelow with Whipple (1853), F. Creutzfeldt and James Snyder with the ill-fated Gunnison survey (1853-54), Sereno Watson with Clarence King (1869), John Merle Coulter, Cyrus Thomas, Townshend S. Brandegee and others with Hayden (1866-1886), Joseph T. Rothrock with Wheeler (1873-75) all made significant contributions to the knowledge of the plants of the Rocky Mountains in general and of Colorado in particular.

The foremost woman botanist of the nineteenth century started her career in Colorado. Alice Eastwood came to Denver at the age of 14 in 1874. She attended school in Denver and later taught at East High School. She became interested in plants and spent her summers collecting — her collections formed the nucleus of the herbarium at the University of Colorado — and in 1890 she published *A Popular Flora of Denver, Colorado*. A couple of years later she deserted Colorado for California, where in time she became Chief Curator of Botany of the California Academy of Science, a position which she held for 57 years.

She became well known to botanists throughout the world, serving as honorary president of the Seventh International Botanical Congress held in Sweden. She retired at the age of 91 and died at 94. All of her namesakes are Californians except for a subspecies of sandwort, *Arenaria fendleri* ssp *eastwoodiae*, which grows in Colorado.

During Colorado's first hundred years as a state, many botanists have lived and worked here, so that now discovery, either of a new plant or one new to Colorado, is a rarity. To comment on them all is beyond the range of this paper, but perhaps it is not amiss to name some of the manuals and floras that have been produced during this time. Alice Eastwood published *A Popular Flora of Denver, Colorado* in 1893. In 1906, Axel Rydberg (for whom the alpine goldflower, *Rydbergia*, was named) from Colorado A. & M., published a *Flora of Colorado*. Dr. Aven Nelson, professor of botany at the University of Wyoming, did a complete revision in 1909 of John M. Coulter's *Manual of Rocky Mountain Botany*. (Nelson's namesake is *Delphinium nelsonii*, the early blue larkspur of the foothills.) Francis P. Daniels, who taught botany at the University of Colorado in the summer of 1906, published a *Flora of Boulder and Vicinity* in 1911. In 1914, Frederick E. Clements and his wife Edith S., both associated with the Carnegie Institution and the Alpine Laboratory on Pikes Peak, published *Rocky Mountain Flowers*. Professor H. D. Harrington, also from Colorado A. & M. (now Colorado State University), published in 1954 a *Manual of the Plants of Colorado*, a colossal work covering the entire state. A second edition was printed in 1964. He also has a namesake, *Penstemon harringtonii*, having big blue flowers with extruding stamens. Dr. W. A. Weber, curator of the herbarium at the University of Colorado, has published a fourth edition of *Rocky Mountain Flora* (1972), a field guide to plants of the Front Range. *Saussurea weberi* was named for him. Ruth Ashton Nelson's *Handbook of Rocky Mountain Plants* (1972) covers the mountain range from Montana to Arizona and New Mexico. She has also done a manual on *Plants of Rocky Mountain National Park*, the latest revision in 1970. Just about to be released is a similar work on the plants of Zion National Park. Walter Pesman's *Meet the Natives* has gone to six editions and is probably the most popular guide for amateur plant lovers because of its simplicity. He covered both mountain and plain and east and west in non-technical fashion. All of these works have been built upon the foundation of the work of the scores of botanists and collectors who have wandered over the state, enumerated their finds, and contributed them to the various herbaria, both in the state and in the east.

Colorado's first one hundred years as a state and even the fifty years before statehood have been most fruitful botanically.

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Three Colorado Botanists and the Geneva Glen Columbine



David J. Luebbers

The Geneva Glen columbine (*Aquilegia caerulea* var. *daileyae* Estw.) provides an unbroken link between botanist Alice Eastwood (1859-1953) and two prominent Denverites, Anna Emily Dailey (1872-1935) and the Rev. Harold McKinley Gilmore (1896-1975), who were seldom recognized for their botanical contributions.

The Denver Botanic Gardens, Inc., sponsored its first field trip in search of the Geneva Glen columbine seventy-eight years after it was first described by Alice Eastwood. On July 2, 1975, three specimens were observed at Geneva Glen Camp, Indian Hills, Colorado. They were located in a moist, north-facing valley below Mount Geneva on the Sacred Trail at 7,500 foot elevation. While the photographers recorded the rare blue spurless columbine with its ten ovate sepals with acute tips, the botanists concluded that laboratory tests would be needed to distinguish between petals and sepals. Because adjacent Colorado blue columbine (*Aquilegia caerulea* James) exhibited normal and abbreviated spurred petals, discussion centered on the possible recessive genetic character of the star-flower. Speculation was heightened when it was learned that several decades had elapsed since the last sighting of a spurless columbine in the type area near the Dailey Cabin, 4.1 miles away in Evergreen. The mystery



remains unsolved.

In the same valley, Miriam Denham was surprised to find wild sarsaparilla (*Aralia nudicaulis* L.). Helen Zeiner collected a ricegrass uncommon to the foothills (*Oryzopsis pungens* (Torr.) Hitch.) that was locally abundant. Lucian Long quickly demonstrated how to differentiate between spotted coral root (*Corallorhiza maculata* Raf.) and spring coralroot (*Corallorhiza wisteriana* Conrad) that grew in abundance. The photographers were thankful for the wide selection of subject matter, the brilliant sky and the sheltered valley that calmed the winds. While the group was disappointed to have missed the normally plentiful red wood lily (*Lilium philadelphicum* L.), it was pleased to have visited an area whose natural character was conscientiously maintained.

The field trip was climaxed by lunch and a guided tour at the historic Dailey Cabin in Evergreen where Anna Emily Dailey discovered the spurless columbine near Bear Creek some eighty-five years ago. Anna's artistry still graces the charming summer retreat built by her prominent Denver parents in 1887. She was graduated with honors from the Chicago Art Institute, circa 1899. Her hand painted manuscript *Colorado Wild Flowers* containing sixteen detailed watercolor illustrations, a gift for her

sister's birthday in 1894, brought favorable comments from the twenty visitors. Examples of her world famous ceramic Peace dolls were on display. Paintings, sketches and watercolors hung in bedrooms, alcoves and livingroom. Some of the furniture survived the difficult westward journey across the Great Plains in covered wagons, while other pieces were acquired over the years. History and botany blended into gentle conversation as the group dined on the screened-in porch overlooking a turbulent Bear Creek enjoyed by six generations of the Dailey Family. It was easy to imagine why the Daileys would spend two days riding by horse or wagon to reach this isolated valley. No wonder Mary Pickford and Douglas Fairbanks, Sr., chose to honeymoon in a cabin a mile upstream. Reluctantly, the group bade farewell to its host, the Allan Vickers Family, and descended into the summer heat of the plains below.

Returning to Denver, we thought of botanist Alice Eastwood. It had been a century since she left Canada and her uncle's experimental vegetable garden for the rigors of frontier life. In 1873, Alice joined her widowed father, Colin S. Eastwood (1827-1918), and younger sister and brother in Denver where she developed an early capacity for hard work and independent action. When her father remarried two years later, they moved into the basement of the Broadway School. To make ends meet, Mr. Eastwood worked as a porter and clerk by day and as the school janitor by night. To help out, Alice watched over the youngsters, cleaned the chalk boards, and fueled the wood-burning furnace. Sewing dresses at Daniels and Fisher provided extra money needed for her weekend and summer botanical studies in the Front Range and beyond. While an unescorted woman trekking through the mountains was an uncommon sight, Alice was equally uncommon at her studies. She read most of the school library books before she



Alice Eastwood ca. 1879.

was graduated valedictorian from old East High School in 1879. She remained at East High to teach Latin, botany, writing and other subjects before embarking on her life work as the Curator of Botany at San Francisco's Golden Gate Park in 1892.

Alice's new stepmother introduced the Eastwood Family into the Unity Church (First Unitarian Church) where they met the pioneering Dailey Family. John L. Dailey (1833-1908) and partner William N. Byers established the first newspaper in the mountain states with the publication of the *Rocky Mountain News* on April 22, 1859 from their press sheltered under a tent on the bank of Cherry Creek, the same year Alice was born in Toronto, Canada. Dailey cherished his short residency in the gold camps of Gregory and Russell gulches, but he always regretted participation in the cruel Battle of Sand Creek in 1864. A pioneer in every sense, Dailey started the first school south of Cherry Creek in his parlor at Fourth Avenue and Broadway in 1875. He built a new school house on his property and donated it to the city in 1879, just as Alice was graduated from East High. He held several offices including Treasurer of Arapahoe County, first President of the

Denver Parks Commission, President of the School Board, and a Trustee of Unity Church. However, Dailey's primary interests lay in printing and land development. Perhaps the establishment of the Eastwood Printing Company by Alice's younger brother was affected by this family tie.

When Anna found the spurless columbine at the family retreat, she sent specimens to Alice, who then applied the varietal name *daileyae*. Because Anna attended Wolfe Hall and other private schools, her ties with Alice Eastwood probably were established through the church, where they taught Sunday School. Years later while teaching art at Byers Junior High, Anna permitted the Max Gieseckes to press and frame a columbine for their wall. Giesecke, founder of the William H. Jackson Color Camera Club, took one of the last photographs of Alice, *circa* 1952.

All of this was unknown to the Rev. Harold Gilmore, Director of Geneva Glen Camp, where he gave the spurless columbine its common name in 1931. He developed a conservation policy that permitted the survival of this rare wild flower and its habitat for the enjoyment



Anna Emily Dailey, ca. 1879.



The Rev. Mr. Harold McKinley Gilmore, ca. 1940.

of generations to come. As a former professional scouter with the Denver Area Council of the BSA and through his association with ornithologist Robert Niedrach, his respect for the creations of nature was intensified. Extension of roads into the camp property was prohibited. Disturbance of wildlife and discharge of firearms were forbidden. Wood gathering and camp fire sites were restricted. Asphalt and concrete were never his materials for building a better world, and he always said, "Don't pick the wild flowers if you want to see them again." It was that sort of thinking that sparked his support for the recent compilation of environmental resource data of the Indian Hills area. Four miles away, millions of persons can testify to his desire to share the natural beauty of the foothills through the Red Rocks Sunrise Services that he initiated decades ago while General Secretary of the Colorado Council of Churches.

It seems only fitting that this unique flower should bring together the accomplishments of these three Colorado pioneers — an intrepid botanist, a talented artist, and a moral leader of the community.

Color post cards of the Geneva Glen columbine may be purchased at Geneva Glen Camp or the Gift Shop at the Denver Botanic Gardens.

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Alice Eastwood, photographed for her 80th birthday celebration, Jan. 19, 1939.

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PERSONAL INTERVIEWS

Mrs. Katharine B. Crisp, friend of Miss Eastwood. Miss Mary C. Frost, former Sunday School student of Miss Dailey. Mrs. Max (Smedley) Giesecke, acquaintance with Miss Dailey and her flower. The Rev. Mr. Harold Gilmore, Director of Geneva Glen Camp. Mrs. Iris Pavey Gilmore, co-worker of the Rev. Mr. Gilmore. Mrs. Lucinda (Utter) McCourt, former Sunday School student of Miss Dailey, owner of ABC Doll House. Mrs. Allan (Peabody) Vickers, grand niece of Miss Dailey.



Carnivorous Plants

James R. Jackson

Flytraps, sticky tipped sundews, and pitcher plants, whose pools drown prey, grow in display at Denver Botanic Gardens.

Some 450 species of carnivorous plants can be found throughout the world. Their usual habitat ranges from tropical swamps to upland marshes. These plants use unique equipment to attract, capture, and digest tiny animals. Typically, the carnivorous plants grow in soil that is wet, acid, and often, but not always, deficient in nitrates and phosphates (essential plant macronutrients). Other carnivorous plants can be found on trees, in swamps, or in water. It has been hypothesized that carnivorous plants survive in poor soil because their prey provides nitrogen and phosphorus so that the starches and sugars produced in photosynthesis can be converted into such compounds as plant proteins, nucleic acids, and others. This theory has come under considerable attack recently because many of the habitats of these plants do not lack these nutrients.

The flowering carnivorous plants use three basic types of modified leaves to capture prey. The "snap-trap" type

snaps its leaf halves together to imprison unwary insects. Some species bog their victims down in flypaper-like, sticky secretions. Victims of the "pitcher plants" fall to their death in a pool of dilute digestive fluids.

SPIKED LEAVES ARE A BOTANICAL AMBUSH

The Venus flytrap has a rectangular shaped snap-trap which consists of two lobes united along the midrib of the leaf. The margins of the trap are equipped with spines (fig. 1). On each of the two inner lobes of the traps are three trigger hairs arranged in a triangular pattern. Covering most of the inner surface of the trap are two glands. The alluring glands attract insects with a pleasing odor and a sugary substance. Upon capture, the red digestive-absorption glands dissolve and absorb the prey. Usually a single trigger hair must be stimulated twice, or two hairs must be stimulated in succession, for closure to occur. If suitable prey is detected by the Venus Flytrap following trap closure, the narrowing phase is initiated and fluids containing digestive



Dionaea muscipula

compounds are secreted. After digestion and absorption have occurred (8-12 days), the trap opens, exposing the undigestible remains of the prey.

The mysterious forces which cause the Venus flytrap to close have fascinated science for years. Recently it has been suggested that while the trap is open the epidermal cells are stretched tight by the subepidermal cells. Stimulation causes a loss of turgor (water pressure) in the subepidermal cells. Since the cells of the outer trap surface are thicker and less elastic than those of the inner surface, the inner surface stretches much more than the outer trap surface. This differential stretching causes trap closure.

The Venus flytrap (*Dionaea muscipula*) is native to the coastal plains of North and South Carolina and is usually found in the ecotone (transition zone) between the wet evergreen bogs and the dry, sandy, long-leaf pine zones. This zone is subject to frequent surface

fires, to which Venus flytraps seem quite resistant. In fact, they are among the first plants to re-establish on any burned over area. The fire resistance of these plants is equaled by their ability to function for short periods of time submerged under rising bog waters. Small aquatic animals, planaria, mayfly larvae, and even small newts have been found in the traps of flooded flytraps.

Dionaea muscipula may be grown with some difficulty from rhizomes which can be purchased from nurseries. Because these plants require high humidity a relatively closed container such as a terrarium is suitable. The soil should be peat moss, sphagnum, or acid sand (pH of less than 6) around 4 - 7 inches deep. Conditions of limited light should be avoided.

Sundews have a very effective method of obtaining prey. Passing flies immediately become mired by barely touching some of the mucilage globules on this plant (fig. 2). The more the fly



Drosera capillaris

squirms and buzzes, the more it sticks to globules from tentacles close by. Soon the victim is helplessly wallowed. Then a second deadly tactic is used. One by one, the bristles begin to bend around the fly, trapping it as if in the tentacles of an octopus. In less than an hour the grip of the tentacles has completely immobilized the victim and it is being digested alive by fluids secreted from the plant. Within two hours little can be seen of the fly except a dark mass of fluid. Within a few days the digestion and absorption is complete and the tentacles assume their normal position ready for the next unwary insect.

The modified leaves of the sundew are covered with what is commonly called tentacles, which are comprised of a spherical mucilage-covered gland on top of a tapering stalk. The tentacles generate, accept, and convey the stimulus for folding as well as secrete the sticky mucilage and digestive enzymes. Bending of the tentacles is brought about by the elongation of cells on the side of the tentacle opposite the direction of the bend.

Seven of the one hundred or more species of *Drosera* (sundew) can be found in the United States. Sundews thrive in wet savannas, moist sandy

regions, bogs, and swamps. They are generally found in the eastern United States in acid soil but their environmental range is much greater than that of the Venus flytrap.

The methods used in growing these plants are similar to those used for the Venus flytrap, but some species require special attention, such as a dormancy period or seed stratification (subjection to a cold period).

TANK TRAP HOLDS DEADLY POOL

Pitcher plants have a rather passive method of capturing their prey. The modified pitcher-shaped leaves of this plant (fig. 3) lure insects into the pitcher opening by attractive odors, coloration, and copious quantities of nectar. As the insect discovers the nectar, it travels to the nectar glands just below the rim of the pitcher, which are intermingled with hairs pointing down toward the deadly pool below. It is much easier for the insect to walk in the direction that the hairs are pointing than to walk against them. As the insect continues, it reaches a waxy zone which offers no foothold and it falls into the liquid. Usually the insects seem to sense something ominous and attempt to leave the pitcher before it reaches the waxy zone, but they discover that this is impossible due to the downward point-



Sarracenia purpurea

ing hairs. Once the insect falls into the liquid, it is digested by enzymes secreted from glands at the bottom of the pitcher. The bacteria dwelling in the liquid also help a great deal in the digestion of the insect.

Deadly as the pitcher plant may be, it offers food and housing to many organisms. Several species of moths lay their eggs in the pitcher plant. After hatching, the larvae feed on trapped insects and the pitcher plant itself. Organisms that live in the fluid are fungi, bacteria, and insects. A mosquito lays its eggs in the digestive fluid, and the larvae develop to maturity there, evidently immune to the enzymes. Flies of the genus *Sarcophagus* lay their eggs in the pitchers and the resulting maggots thrive on the dead and decaying insects found there. Spiders and even small toads have also been observed living in the pitcher plant and competing for their unwary victims.

Pitcher plants are in the genus *Sarracenia* and there are eight species reported in this genus. All species of *Sarracenia* will thrive in peat moss (Sphagnum). The plants require high humidity and a terrarium is suggested. It should be noted that high temperatures are lethal to these plants and should be avoided.

FUNGAL LASSO SNARES PREY

Several species of fungi form small single cell rings. When aquatic nematodes happen to pass through these rings, they are trapped when the ring swells. After the nematode is held in place, a capturing branch grows a pene-

trating tube which enters the nematode body and withdraws nutriment.

Unlike the previously mentioned plants, this fungal carnivore derives not only nutrients from its victims but uses them as energy sources as well.

FANTASY SUGGESTS MAN EATING TREES

Although carnivorous plants have revealed many intriguing methods of capture, few rival the "Man eating tree of Madagascar" that was presented as fact to newspaper readers by over-imaginative writers several decades ago. They described a "cannibal" tree that had a demonic intelligence capable of ensnaring young human female victims with snakelike tendrils. The popular literature of this time had many such descriptions but none were ever substantiated. Should anyone encounter such an organism, please notify me and we will make room for it at the Botanic Gardens.

DENVER BOTANIC GARDENS HAS A VARIETY OF CARNIVOROUS PLANTS

During the current season, the Denver Botanic Gardens has a display of many of the carnivorous plants mentioned in this article. This article in no way describes all of the carnivorous plants, but rather those most common or most interesting to the author. A list of references follows in case further information about the mentioned species or other species of carnivorous plants is desired.

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Joys of a Garden



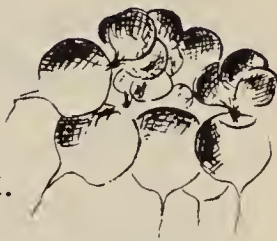
Lisa Cummings*



'Twas the hour for planting,
And all through the plot,
Not a pebble was lurking —
We had spaded a lot.

The rows had been lined up,
With infinite care.
In hopes that young seedlings,
Soon would be there.

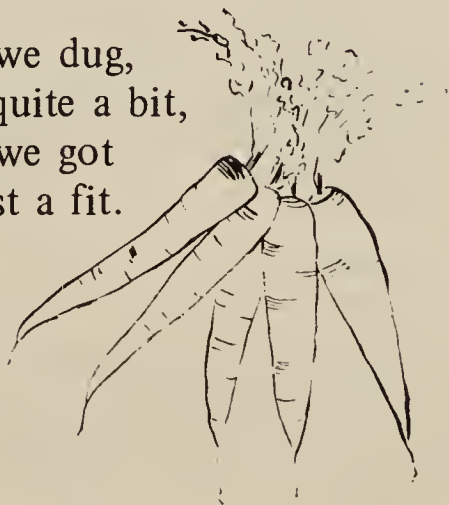
The beans and the lettuce,
Came up with a burst,
But the radishes beat them,
'Cause they popped up first.



The squash and kohlrabi,
Arose like a shot.
And the bedding plants thrived,
What a wonderful plot!

But faster than carrots,
And quicker than corn,
The weeds soon took over,
And the plants looked forlorn.

We pulled and we dug,
And it helped quite a bit,
But the candy we got
Gave our dentist a fit.



Just when we figured,
the Garden looked great,
Along came a hailstorm,
What a terrible fate.

But we pampered each plant,
And talked to them sweetly
So they lived through disaster,
And grew even more neatly.

'Course we made some mistakes,
Some were awful indeed,
Like we pulled up a pepper,
Thinking it was a weed.

We'd have many more errors,
Since this was our first year
If it weren't for the helpers
Who were always so near.

There's no doubt the most fun,
Was the harvesting time,
When we ate home grown food,
Without spending a dime.

Now the gardening is over,
I say with a tear
It's been a wonderful summer,
I'll see you next year;

THE END



*Lisa, age 11, is a gardener in the Children's Garden Program.

Getting Acquainted with Cacti

Jack Holland

This is the first of a series of articles dealing with that intriguing family, the *Cactaceae*. Consisting of nearly twenty-six hundred species, the cacti are strictly American in their origin, and are found from the Straits of Magellan to the Peace River of northern Canada. (Respectively, *Opuntia australis* and *Opuntia fragilis*.) Although three or four species of *Rhipsalis* have been found in Madagascar and Borneo, these same species are far more prevalent in the Americas; this, and the fact that the seeds of these particular species are rather mucilaginous and readily adhere to the feathers of birds, suggests a New World origin for them.

Cacti are the only existing plants that have areoles. These specialized organs are easily seen on prickly-pear and tree cactus as round or oval areas from which grow the spines, the flowers, and new growth. All cacti have these areoles, but on many species they are not readily apparent. Cacti are believed to have evolved from some liana-type plant, and are of rather recent origin, from a geological viewpoint. The one that is generally considered as progenitor of the entire race, *Pereskia aculeata*, probably came into being some thirty-five thousand years ago. According to some anthropologists, that would be about the time the first *Homo sapiens* crossed the Bering Strait into North America. There is a bit of controversy concerning just where they first became a plant in their own right. Some seem to favor some island of the Caribbean Sea, but others feel that their genesis was in Mexico, near the Gulf coast. I'll cast my lot with the latter.

A great many people harbor two misconceptions concerning cacti: 1) that

they are all desert plants (xerophytes), and 2) that they are all very spiny. The truth is that some grow in the rain-forests of Central and South America, with some even growing in the crotches of trees (but not as parasites). Some, as the rice-cactus, the orchid cactus, and the Indian fig are normally devoid of spines. Some, such as those called old man cacti have spines which are not readily noticeable, but the plant is covered with a wooly growth called cephalium. Most of our cacti have a plentiful supply of spines. Cacti range in size from the tiny (and rare) *Pediocactus knowltoni* of southwestern Colorado to the giant sahuaro of Arizona and even heavier *Pachycereus* of the State of Sonora, Mexico.

Cacti are grouped into three tribes. The first tribe is the Pereskiaeae, the most primitive of all cacti, and the only group having true, persistent, leaves. The fruits of one species of the genus *Pereskia* is known as barbados gooseberry. Tribe II, the Opuntieae, includes the opuntiads, the only cacti bearing tiny bristles (glochids) in their areoles. These are easily detachable and are quite irritating, as they are difficult to remove from the flesh. Our prickly-pear and cholla types belong here and many possess edible fruits. It was this attribute that caused certain species of *Opuntia*, particularly *Opuntia ficus-indica* (Indian fig), to be taken to the shores of the Mediterranean Sea very early in the sixteenth century, where they long ago became naturalized. Often one can buy "fruits of tuna," an allied species in Denver markets. With us these are usually eaten uncooked, like many other fruits.



Opuntia ficus - indica being developed in Israel as forage.

Tribe III, the Cereeae, named for the Roman goddess of agriculture, contains the most species and the smallest and largest specimens. These are the farthest along on the evolutionary scale. I feel safe in saying that here we also find the largest and most beautiful flowers.

Although in the United States we usually associate cacti with the arid southwest, and they are more prolific there, they are found in nearly all parts of the country. I believe Vermont is the only conterminous state where there have been no native cacti found. Texas is reputed to have more species than any other state, while Colorado has less than two score species. Hopefully we shall concentrate on our native species in some future article.

That cacti are still evolving is accepted as a fact by most botanists. This is evident if one studies cacti from

the Mexican border to Montana including the cactus from Colorado described by Dr. Engelmann in 1848.

The economic value of cacti was quite important as a food to the aborigines of the western United States and countries to the south. Luther Burbank, the great plant breeder, once tried to popularize varieties of this species as food, but the joints were to be drenched in flour and fried and the public didn't take to this idea. Many species of *Opuntia* have been used as forage for livestock after having the spines burned off. It is possible to buy "cactus candy" made from some of the species of *Ferocactus*, but to me it is unpalatable, to say the least. And, we must not forget the peyote cactus (*Lophophora williamsi*) that has a deep religious significance to the Indians of certain New Mexico tribes.

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Exotics of COLORADO



HAIL THE LOWLY RHUBARB!

Editor's Note

"Hail the Lowly Rhubarb" appeared in *The Green Thumb* in September, 1959, the centennial year of the "Rush to the Rockies". It is being reprinted in 1976 because it is also appropriate for Colorado's centennial year.

It now appears as an "Exotics of Colorado", a series begun in 1961. *Rheum rhaponticum* L. is an exotic originating in Siberia but much improved through selection and plant breeding. It belongs to the buckwheat family, *Polygonaceae*, and is related to common plants such as cultivated buckwheat, dock, sulphur flower, knotweed, and bistort.

Helen Marsh Zeiner

In this Centennial year in Colorado, we have become much interested in pioneers and descendants of pioneers. We are so concerned with the people who came to Colorado that we are apt to completely overlook the plants they brought, some of which have survived, become established, and are as firmly rooted in Colorado as the descendants of any pioneer.

One of these plants is the common rhubarb, *Rheum rhaponticum*. The pioneers who brought it west no doubt called it "pie plant," and exceedingly good "pie timber" it was. This hardy plant could stand the long trek across the plains, and how many roots must have made that difficult trip. Planted near the cabin of its owner, the pie plant was soon at home. As it thrived,

the roots were divided with other settlers who were neighbors. Rhubarb would grow almost anywhere — on the plains, in the foothills, in the mountains, even at timberline.

Today many pioneer homes are completely gone or are only crumbling foundations, but the pie plant is still there. Harrington, in his *Manual of Plants of Colorado*, says “This is a cultivated species sometimes tending to escape or persist in vacant lots and fields. It has been found growing in the Colorado mountains away from any dwelling but the plants may have been originally set out by someone.” I think it is very probable that these plants were set out by someone whose dwelling, never a very sturdy structure, has long gone and left no trace — only the

rhubarb to mark where it might have been. Rhubarb is sturdy stuff. Not long ago I found a healthy patch growing by a tumble-down stable in a tumble-down town just at timberline. No one had lived in this town since the early 1900’s, but the rhubarb had survived in complete neglect under most extreme conditions. In more suitable locations, old home sites are often marked by a rank and luxuriant growth of pie plant.

In these high altitudes with little native fruit, how welcome the rosy sauce and juicy pie must have been to the weary miner at the end of his long day. We often tend to look down on rhubarb, but this commonplace little plant served a useful place in pioneer history, and many times has survived over great odds. Hail the lowly rhubarb!

Reference

Harrington, H.D. *Manual of the Plants of Colorado*. Denver: Sage Books, 1954.

The editor is extremely sorry that Mr. George Cranmer’s name was misspelled in the Autumn issue of the *Green Thumb*.

Our deepest apologies.

The Plant Data Bank

Walt Rowley

Imagine that a call is received by CSU's department of botany and plant pathology reporting that a number of graze cattle have become acutely ill in Weld County of Colorado. A veterinarian at the scene has diagnosed the cause as a poisonous weed which the cattle have eaten.

A request to CSU might be: What weeds causing belching and bloating exist in Weld County? Are these likely to be present in the described location?

At CSU, not many minutes need pass before the query is answered. The weeds are identified, their location described and the specific weed responsible for the cattle illness labeled.

Such speedily transmitted information can be useful to the cattle raiser who then can take immediate steps to eradicate the poisonous weed or move the cattle to another pasture. In addition, it should be helpful to the veterinarian in treating the afflicted animals.

It's all done by electronic computer. Normally, such a request as in the hypothetical case just cited would require many hours or even days of a botanist's time to go through some 50,000 preserved plant specimens in the CSU Herbarium's collection to identify the various species in any single county.

A centralized and computerized data bank at CSU for providing environ-

mental information in Colorado is known as the *Rapid Access Plant Information Center (RAPIC) of Colorado*.

Eventually, in addition to the 50,000 specimens in the CSU Herbarium, RAPIC will include data from the herbaria of the University of Colorado, the University of Wyoming and the U.S. Forest Service on the CSU main campus.

RAPIC is a new concept in the use of higher plant ecological classification—the computerizing of plant and environmental data from the various geographical regions of the state. It is the outgrowth of a rapid access plant information retrieval (RAPIR) computer project developed in the department of botany and plant pathology over the past four years.

Dr. Robert P. Adams, CSU associate professor of botany, is principal investigator in the research program. Basic financial support has come from the CSU Experiment Station, with supplemental funding from The Stark Foundation and the National Science Foundation.

Adams said he sees RAPIC as highly useful to biologists, ecologists, foresters, agronomists, horticulturists, soils specialists, large animal specialists, farmers and stockmen, county extension agents and veterinarians.

He said, however, that the system

may have its heaviest impact on land use planning.

“I don’t think the land use people are as interested in individual plant specimens as they are in what species occur in specific locations and whether the species is rare, noxious, weedy, or poisonous,” he said.

“What they really want to know is whether species on a site are native or introduced by man; in other words, the kind of vegetation. If the vegetation is very native, or natural, for example, it might be decided to reroute a proposed roadway, or to relocate a proposed structure or development so as to preserve the natural environment.”

RAPIC, Adams pointed out, will be able to save weeks or perhaps even months of land use planners’ time by providing computerized environmental data promptly. Maps showing plant distributions for all parts of the state can be superimposed in the computer onto any one of the 24 different geographical base maps which have been compiled in the department.

The base maps depict such various characteristics as elevation, soil composition, habitat, precipitation, temperature, land surface forms and highways, to name a few.

RAPIC, therefore, will be able to deliver computerized print-outs in answer to almost any question asked of the data bank concerning the identifications, characteristics and locations of all the higher forms of plant life in the state.

Other benefits of the system include information on:

—Erosion control and game cover — determining whether plants on a given site are useful for these purposes and what other species would be beneficial.

—Revegetation — providing information as to which species is native or is useful for revegetation in a specific habitat; for example, in connection with post-oil shale operations.

—Use as a land-management tool protecting vegetation from heavy pedestrian traffic in state and national parks by listing those species which indicate environmental deterioration.

—Location of minerals — predicting by the presence of certain plants that the soil may have a mineral content, such as copper, boron and cobalt.

—Projection of changes in vegetation — making strategy estimates of whether a certain species is likely to occur in a specific area in the future, based upon available knowledge of the area and comparing this information with similar habitats for a computerized estimate.

—Identifications of plants considered to be allergenic — providing data concerning offending pollens in specific areas so that allergy patients may be tested with extracts from pollens prevalent in their own localities.

—Plants producing certain disease symptoms in livestock. “We’re now carrying in the data bank approximately 60 symptoms reflecting plant poisoning,” said Adams. “We can relate a poisonous weed to the symptom directly in the computer, once we’re given the geographic location and elevation and some description of the plant, then we can compare the computer-generated species list with the actual specimens on the herbarium sheets and verify an exact species.”

—Location and types of plants in specific counties — assisting botany teachers in the state’s two-year junior colleges, for example, in their class instruction.

“There are a number of systems in operation around the country similar to what we’re working on,” he added, “but none that I know of that operates on the basis of a centralized data processing center for statewide use of the type we’re developing here.

“We’re pioneering the effort to bridge the gap between the purely scientific kinds of biological data and the applied

user, such as the farmer, the land use planner, or even the veterinarian.”

He said the rapid access system does not supplant the CSU Herbarium; rather, “it is complementary to it but separately funded.”

Involved in the total operation are the geographical base maps and plant distribution maps, prepared checklists, an electronic digitizer and a Texas Instruments, Inc., 700 Electronic Data Terminal.

A checklist has been prepared for each plant species in Colorado. It is used to pinpoint data for the electronic digitizer to key punch cards for the computer. One checklist (several cards) can be punched with all pertinent data in as short a time as three to four minutes.

The base maps have been photographed and the map lines have been digitized (converted into points), punched on computer cards and entered into the computer, then stored on magnetic tapes. Actually, disc recordings, transferred from the magnetic tapes, are used in the computer. The tapes serve only as a backup.

The data bank contains some 160 descriptive characters, called descriptors, for each of the approximately 3,500 plant species known to exist in Colorado. Multiplied, these descriptors add up to about 560,000 pieces of information which also have been punched on computer cards, entered into the computer and stored on magnetic tapes. The system can be asked for any combination of descriptors for any one or more plants in the state.

To query the computer, the electronic data terminal is used. This is a portable remote control access device resembling an oversized typewriter with an attached telephone and contained in what appears to be a large suitcase. One

such unit now is on hand in the Plant Sciences Building at CSU.

The portable remote terminals can be used anywhere in the state for interactive connections to the computer in the CSU Computer Center — even from a public phone booth. The operator merely dials the prescribed telephone number at CSU, types out his request on the typewriter-style keyboard and his answer is returned on the same machine.

Queries presently are directed to the RAPIC headquarters in the Plant Sciences Building. Later, when the system is fully set up, they can be placed with the Computer Center itself.

Adams said he is hopeful that portable terminals eventually will be used in all higher education institutions and in the state's county extension offices.

He said the current emphasis has been on the data processing of Colorado's native plants and weeds but predicted that horticulture varieties probably would be brought into the computerized program in the future.

Another foreseeable possibility, he predicted, is the establishment of national mapping centers which will offer computer graphic plotting and mapping on a countrywide scale.

Adams, who came to CSU in 1969, started research on the rapid access plant retrieval program in 1970. From 1970 to 1972, Dr. William D. Klein, then curator of the CSU Herbarium, was associated with the project until he became affiliated with the Missouri Botanical Gardens of St. Louis two years ago.

Currently assisting Adams in the program are Dr. Deiter Wilken, present curator of the herbarium, and Richard G. Walter, assistant professor of botany and plant pathology and a recognized specialist in poisonous plants.

(Reprinted from CSU RESEARCH 24:8-9)

A Brief History of CSU

John Newman
University Libraries

James E. Hansen II
Department of History

*Colorado State University
Fort Collins, Colorado
October, 1975*

A school for the promotion of agricultural science and the mechanic arts, located in the Great American Desert, with nothing in sight more suggestive of enlightened civilization than dry prairies, dotted with cactus patches, bestrewn with bleaching bones of departed buffalo, and inhabited by prairie dogs, coyotes, and buzzards, with only here and there a little oasis among the creek bottoms, was an enterprise that was considered both amusing and pathetic.

In 1877, Colorado's first General Assembly reaffirmed an 1870 territorial law locating an agricultural college at Fort Collins, despite such opposition as that cited above. Events of the past ninety-eight years refute that pessimistic assessment. Today, Colorado State University has an enrollment of over 16,500 students in nine separate colleges with approximately 900 academic faculty. The University also directs a variety of important research programs, and its Extension Service reaches people throughout the state. Activities in such areas as wind engineering, irrigation engineering, veterinary medicine and agronomy have achieved international reknown. Moreover, the institution recently earned the highest level of accreditation possible, following a review by the North Central Association.

These accomplishments could not have been foreseen in the 1870's, however, and initial prospects for the school were gloomy. Fort Collins residents sought the college to fill the void left by a military post which closed in 1867. Although the school won approval in 1870, it received no funds from the territorial legislature except for a token appropriation of \$1,000 in 1974. Nonetheless, land was set aside in Fort Collins, and local residents, together with such agricultural organizations as the Grange, kept the idea of an agricultural college alive.

This determination was rewarded in 1877 when the General Assembly of the new state organized the administration of the school under a State Board of Agriculture. This action was influenced by the Morrill Act of 1862 which pro-

vided grants of public land to each state for the endowment of one or more colleges offering instruction in "such branches of learning as are related to agriculture and the mechanic arts . . . to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." In order to benefit from this "land-grant" support, participating states had to contribute additional financing for building, equipment, and maintenance.

Colorado officially accepted the terms of the Morrill Act in 1879, and in September of that year, the school at Fort Collins welcomed its first students. Funding had been provided for a Main College Building, where President Elijah E. Edwards and a two-man faculty greeted fewer than twenty pupils. Classes during the first term were designed to prepare students for college-level work.

A major problem for many Morrill Act colleges of that era was to provide instruction with practical relevance. Emerging modern sciences such as physics, chemistry, and zoology had to be applied to immediate agricultural questions, including irrigation, crop selection, and pest control. In the land-grant colleges, which were expected to prepare students for agricultural and mechanical occupations, original research often had to precede courses of study.

The College's concern for the practical needs of Colorado was demonstrated when in 1883 it began instruction in irrigation engineering and three years later became the first school in the United States to establish a faculty chair in this field. The person most responsible for this early leadership was Professor Elwood Mead who later achieved international prominence for popularizing a revolutionary concept of water law and bringing inspired leadership to the U.S. Bureau of Reclamation. Lake Mead, the huge storage reservoir in Nevada, memorializes his accomplishments. Although Mead left the College

in 1888, his legacy has remained in the form of academic programs and experimental work. In the latter regard, Ralph Parshall, an alumnus who returned as a staff member, invented the universally recognized Parshall Flume, a measuring device which helped to assure an unprecedentedly accurate distribution of irrigation water.

Experimental activity at the College received significant impetus in 1887 when Congress enacted the Hatch Act, supporting the establishment of agricultural experiment stations at land-grant colleges. Colorado's station was organized in 1888, and its studies of feed-lot management, high-altitude baking, and such crops as wheat, sugar beets, and alfalfa have resulted in enormous economic benefits for citizens of the state. Over the years, the station has also responded to specific agricultural problems. For example, in 1930 the Colorado Growers Association sought help in dealing with the highly destructive carnation root rot organism. Station pathologist E. J. Starkey devised methods of sanitary control which protected the state's carnation industry. Subsequent research by W. O. Holley and others has produced both technical and marketing information beneficial to Colorado growers.

Research conducted under College auspices has thus had a tangible economic impact on Colorado agriculture, as well as augmenting instruction at the school. Also, to spread useful information as widely as possible, the College began in 1880 to sponsor farmers' institutes in various parts of the state. Their purposes were to assess local needs and provide appropriate assistance. Such extension work ultimately became a specialized function, and the Smith-Lever Act of 1914 provided it with important federal fiscal support. In time, extension agents were established throughout Colorado, and such special programs as 4-H clubs have done much to promote the dignity and meaning of



"Old Main," the first major academic building, viewed from College Avenue.



The William E. Morgan Library is typical of modern construction around the Social Sciences Plaza.

agricultural life.

Instruction, research, and extension work were all viable aspects of the College when Charles A. Lory began a thirty-one year tenure as president in 1909. Lory was a practical-minded educator, with a background in agriculture. During his presidency, Colorado Agricultural College developed into a well-rounded technical institution, with teaching programs in agriculture, home economics, engineering, forestry, agricultural economics, and rural sociology. Although the liberal arts were not emphasized, unusually dedicated faculty often provided a vital infusion of humanism and some appreciation for aesthetic pursuits. The Lory years also brought orderly growth and organizational stability to the Experiment Station and the Extension Service.

The period following Lory's retirement proved to be one of disruption and transition. American involvement in World War II in December 1941 threw normal operation of the College into disarray. Enrollment, which had grown from 217 in 1909 to 2,048 in 1940, plummeted to below 800 in 1943. Male students and faculty left Fort Collins for military service, and many regular academic programs were suspended, as were such extracurricular activities as football. The College benefited from the energetic work of President Roy Green in bringing military training programs to campus. Research and extension activities of the period reflected a virtually complete commitment to the war effort by promoting increased agricultural production.

The post-war years saw an influx of veterans, attending college on the G.I. Bill. Also, Cold War challenges were in large part responsible for increased subsidization by the Federal Government of research and training in the sciences. Experimental work funded by private

and governmental contracts began to supersede that of the Experiment Station, and graduate programs assumed a growing significance.

William E. Morgan, who became president in 1949, presided as these and other developments signaled the school's emergence as a modern educational institution. Under Morgan's leadership, resident instructional programs, research, and capital construction proliferated dramatically. In 1955, the College awarded its first Ph.D. degree to Adrian R. Chamberlain, and two years later changed its name to Colorado State University. Real as well as titular university status was reflected in such developments as curricular improvements in the liberal arts and appreciably expanded library holdings, which now approach one million volumes. Between 1960 and 1970, enrollment grew from 6,131 to 17,000, and during the late 1960's, many students seemed more concerned with social and political issues than with the traditional task of preparing for a livelihood. Nonetheless, the mature University of today has emanated from the change and turmoil which often characterized that period.

Since the retirement of William Morgan in 1969, Dr. A. R. Chamberlain has served as president of Colorado State University. His skill in consolidating growth and providing the school with an orderly, rational structure has been reflected in the recent evaluation by the North Central Association; the status of a mature university is an accurate assessment of Colorado State University as it enters its second century. Even the doubting legislators of 1877 would probably admit that the institution has become something more than "a school for the promotion of agricultural science and the mechanic arts, located in the Great American Desert..."

Denver Botanic Gardens Welcomes a New Botanist-Horticulturist

Mr. Lee (D.H.) Schwade, a native of Denver, became the most recent addition to the staff of the Denver Botanic Gardens with his appointment as Botanist-Horticulturist in mid-August



of this year. Mr. Schwade is a graduate of East High School, and of Regis College where he received a Bachelor of Arts Degree, Cum Laude, with a divided major in Biology, Philosophy and Psychology. He laughingly admits that he has had the benefits of a very broad, liberal arts college background which may produce a well-educated person but which did not make finding a job an easy matter. Between high school and college he fitted in two and one-half years service in the U.S. Navy, with some time spent in the Naval Cadet Fighter Pilot Program which led to a strong interest in flying which he still enjoys today. Following his graduation from Regis, Mr. Schwade taught for five years at Holy Family High School in Denver, where he earned a reputation as a highly successful teacher of both biological and physical science.

In 1968 Mr. Schwade started graduate study at the University of Northern Colorado in Greeley, obtaining the Master of Arts degree there in Biological Science in 1971 with emphasis on the plant sciences. Then came a stint at the Community College of Denver, where he completed the curriculum in Urban Horticulture in March of 1975. A short time later he became affiliated with the Denver Botanic Gardens.

At the Botanic Gardens he has been placed in charge of the program in plant propagation with the cooperation of Richard Schimming. Because of his

ability to work with young people, as well as his background in horticulture, Mr. Schwade has been assigned to the Children's Garden program where he assisted in the windup of the 1975 season. He is expected to play an important role in 1976 in the further development of the Children's Garden inaugurated at Barrett School this year by the Denver Botanic Gardens. The plant propagation program will lead him into some aspects of the development of the arboretum and gardens on land being leased from the Corps of Engineers at Lake Chatfield by the Botanic Gardens.

Mr. Schwade characterizes himself as a person who has enjoyed gardening for a long time, but also has a wide range of interest and activities in other fields. He is an avid aviation enthusiast, and within a year will have earned his instructor's pilot license. Sports have been a long-time interest, also, with tennis, skiing and snowshoeing at the top of the list now. In the plant sciences he shows a preference for plant physiology, especially certain aspects of plant nutrition. As is the case with many persons who are interested in plants, he early discovered he enjoyed animal physiological studies, too. Mr. Schwade has completed a year of study toward a doctoral program in Biological Nutrition at Colorado State University.

It is with great pleasure that the Denver Botanic Gardens welcomes Lee Schwade to its staff. He has had time to begin to feel at home at the Gardens where his sunny disposition, his good humor, and his dedication to his work have made him numerous friends and have given abundant indication that he will be a productive horticulturist.

William G. Gambill, Jr.

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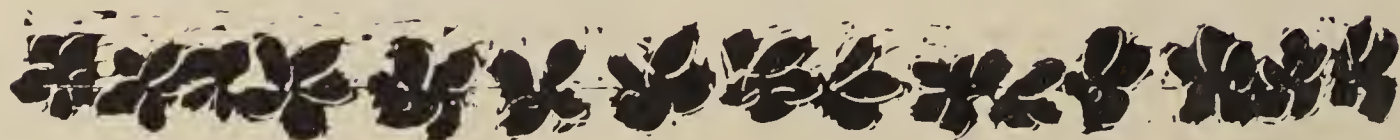
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Denver Botanic Gardens maintains a collection of living plants, both native and exotic, for the purpose of acquiring, advancing and spreading botanical and horticultural knowledge.

DENVER BOTANIC GARDENS

ANNUAL REPORT FOR 1975



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Mount Evans from the Gardens

ANNUAL REPORT FOR 1975

Prepared and Published by the
Editorial Committee
and
Denver Botanic Gardens Staff

William H. Anderson, Jr. Ed.D.
Gilberta T. Anderson
Editors



A Garden View

DENVER BOTANIC GARDENS

1975

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Mrs. J. V. Petersen	<i>Honorary Editor of The Green Thumb</i>
Dr. Helen Zeiner	<i>Honorary Curator of the Kathryn Kalmbach Herbarium</i>

Denver Botanic Gardens

PRESIDENT'S REPORT

1975

I am very pleased to have the opportunity to report to the membership on the results and the activities of the past year, on behalf of the Board of Trustees of Denver Botanic Gardens.

It is appropriate to record here changes in the membership of our board of trustees and other significant staff changes during the year. We are most grateful to the following whose terms have expired and who have retired from the board: Mrs. Brown W. Cannon, Mrs. Howard Rea, Mrs. David S. Touff, Mr. John R. Birmingham, Mr. Alfred J. Bromfield, Mr. George M. Canon, Mr. Harley G. Higbie, Jr. and Mr. Ralph J. Becker. We are very appreciative of the efforts they have expended over the years on behalf of Denver Botanic Gardens, and particularly wish to recognize Mr. Harley G. Higbie, Jr. who has served as Vice President and Chairman of the very important Planning Committee for over ten years. We welcome at this same time new members of the board: Mrs. John F. Falkenberg, Mrs. Richard W. Hanselman, Mr. Junius F. Baxter, Mr. Newell Grant, and Mr. William R. Thurston. We look forward to working with them and know that Denver Botanic Gardens will benefit from their interest and service.

Mrs. Edward H. Honnen has been elected an Honorary Life Trustee following 16 years of service as a member of the active board, and we are hopeful that her enthusiastic interest will continue.

We note with sorrow the death on March 15, 1975 of Dr. A. C. Hildreth, Director of Denver Botanic Gardens from July 1959 to October 1966 and Director Emeritus from October 1966 until March 15, 1975. It was under his direction that the Master Plan of the York Street Gardens was accomplished and its development started. His was a most distinguished career in botany and horticulture, and Denver Botanic Gardens was very fortunate in his association with us.

Membership in Denver Botanic Gardens reached a new high during the year and now is close to 3,000 members. This is an increase of 27% over last year and, we are hopeful, indicates growing interest in our program. Membership, or dues income, amounted to \$39,608, a 20% increase. This provides vital support for our program in addition to covering the costs of the membership publications, *The Green Thumb* and *The Green Thumb Newsletter*. We are confident that this membership will continue to grow and hope that present members will encourage others to participate.

Attendance, as well, has increased during the year but at a slower rate than was evident before the curtailment of travel by developing energy problems. Turnstiles at the gate, however, clocked 234,334 visitors, which is an increase of 2% over 1974.

Denver Botanic Gardens, as an agency of the City and County of Denver, continued to receive gratifying support from the City and County of Denver for its basic maintenance. The budget last year amounted to \$530,400, which represented a 24% increase for the year. We are most grateful to the Mayor and the City Council for this vital support and for the confidence which it indicates in this program.

The operating budget of Denver Botanic Gardens, Inc. was at a new high, \$177,000, and represents funds raised privately through dues, gifts, grants, and contributions of affiliated organizations. These supplement City provided operational funds and also, and very importantly, provide the funding for capital improvements

which are not a part of the City budget allocation. Two major gifts were received during the year, only partially reflected in the above figure. One was a total of \$35,000 contributed by the Associates of Denver Botanic Gardens toward construction and planting of the Hildreth Memorial Garden in the southwest area at York Street and for some initial work at the Chatfield Arboretum. The other was a bequest for unrestricted purposes under the will of the late Miss Anna Emily Bruderlin which will eventually amount to \$78,000.

The Development Fund Campaign which opened in 1969 with a goal of \$850,000 and the supplemental campaign, known as the "War of the Roses", with a goal of \$100,000, were officially concluded during 1975 with a total of \$1,006,000 raised. Unfortunately our fund raising efforts cannot cease as further development and changes in the Master Plan, as well as expanded programs such as that being undertaken at the new Chatfield Arboretum, will always require private contributions. Additional, detailed financial information is provided in another section of this report.

Construction and planting in 1975 showed impressive progress, which it is a pleasure to report. Major construction at the York Street Gardens was virtually completed with the finishing of the West Gatehouse, the Herb Garden Extension, and the beautiful flagstone patio and tiled fountain of the Hildreth Garden. Near the latter, the Lilac Garden has been constructed and will be planted in 1976 with funds provided by the O'Fallon Trust. The two major remaining construction projects at York Street are the Rock and Alpine Gardens and the Japanese Garden, both on the west end.

The extension of the Herb Garden mentioned above, which is a project of the Guild of Denver Botanic Gardens, is being accomplished under the design of Jane Silverstein Ries. Walkways, new beds, and an underground sprinkler system have been added. In addition there are a handsome sundial, a memorial to the late Mrs. Persis Owen, and attractive concrete benches, a memorial to Mrs. Frank McLister. Also during the year, the demonstration home garden originally contributed and constructed by Lew Hammer, was renovated by the Garden Club of Denver following a design of Alan Rolinger and constitutes a fine addition to the south side of the York Street Gardens.

As an indication of the scope of the plantings which took place in the York Street Gardens in 1975, the following statistics are offered, which are expected to be equalled or exceeded in 1976: Rose Garden — 28 varieties, 440 plants; Dahlia Garden — 163 varieties, 329 plants; Hemerocallis Garden — 378 varieties; Iris Garden — 423 varieties; Peony Garden — 22 varieties; chrysanthemums — 29 varieties; water plants — 33 varieties; annuals — 37,000 plants; bulbs — 39,000 planted in the fall for 1976 spring bloom; trees — 175 added for a current total of 375; and shrubs — 1,600 added for a total of 2,950. These numbers indicate the magnitude of the task of planting a botanic garden of only moderate size, such as this, within the space of two or three years. Equal effort must be made in 1976 and undoubtedly in 1977, but it is most gratifying that the planting is going forward following the many years of construction that were necessary to provide the basic services of the gardens.

The Children's Garden program received new impetus during the year. The program at the Barrett School, 29th Avenue and Jackson Street, conducted in cooperation with the Denver Public Schools, started with 38 young students, whose work was supplemented with a garden project carried out by a number of adults in this northeast Denver area. This program should increase to 150 students in 1976. The program at the York Street Gardens has been named in honor of Ruth Porter Waring, who for years has been a staunch supporter, and expansion was commenced with initial preparation of land to the north of Boettcher Memorial Center which will eventually accommodate 100 young persons in more advanced gardening. The existing

Children's Garden area between York and Josephine Streets will be increased by the incorporation of two additional lots on Josephine Street acquired during the year. The Children's Garden program continues to be one of our most important efforts.

The Chatfield Arboretum, a focus of long range attention of Denver Botanic Gardens, showed some heartening progress. The extensive documentation required for the lease of this some 800 acres, on the northwest corner of Chatfield Recreation Area southwest of the City of Denver, was completed and final signing is expected shortly. Some initial clearing and clean-up around the historic old Hildebrand Homestead were accomplished, and the Board met there in July. A start was made on the nursery area, to which 100 woody plants were moved from the York Street Gardens propagation beds. A number of perennials from the U.S. Department of Agriculture Agricultural Experimental Station at Cheyenne also were lined out in a temporary location. Development funds are badly needed for this project, and a development grant to be matched with privately raised funds has been requested from the Colorado Land and Water Fund under the Bureau of Outdoor Recreation program. If received, this should fund the creation of a Master Plan of Development, the moving of an historic schoolhouse which will be used for interpretive purposes, and some planting of the visitor's area.

On behalf of the Board of Trustees I wish to express our continued gratitude to the Mayor and City Council, to the Manager of Parks and Recreation and his staff, to our own loyal staff, and to the hundreds of volunteers, all of whom are responsible in a very material way for the progress which is taking place. The thousands of hours of volunteer time contributed by the Associates, the Guild, the Around the Seasons Club, and the Garden Club of Denver are absolutely vital to our program.

The year 1976 should show continued progress in all areas, and we welcome and urge your support toward that end.

John C. Mitchell
President



Entrance Gates

DIRECTOR'S ANNUAL REPORT

1975

Only when the activities and accomplishments of the year are summarized, as in this report, does one realize how much is going on at Denver Botanic Gardens and how far we have advanced. The Director is proud of the progress made and of the dedicated and diligent people who are responsible for it. He wishes to express his gratitude for the fine cooperation and excellent work of the City and County Officials, the Department of Parks and Recreation, the Board of Trustees, the Membership, the Volunteers, and the staff. What follows is a brief report on a very busy year for us all.

Dr. William G. Gambill, Jr.

Director

Construction and Development of Physical Facilities

An important development on the grounds of the York Street Unit in 1975 was the construction of the Hildreth Garden and its surroundings in the southwest sector of the unit. Carrying out the original plan of Eckbo, Dean, Austin and Williams, with some modification, the land was graded, hundreds of square feet of totally new walkways were laid, and large areas of flagstone paving were installed.

The Hildreth Garden, named in honor of Dr. A. C. Hildreth, director of Botanic Gardens from 1959 to 1965, is described as a "Room with a View" and contains a fountain that is unique in both its visual and audio effects.

The fountain is a tile-lined, walled circle enclosing, at its center, a circular well surrounded by two semi-circular pools, the one on the west being the larger of the two. Above the pool on the east is a trough. Using only its own separate recirculating water system, the sound of rushing water is achieved by the unique design of the fountain. Water in the west pool cascades into the center well and into the east pool, then is recirculated into the trough and runs back into the pool through three slots in the wall, cascading again into the center well. Herbert R. Schaal, one of the planners, describes the effect in this way: "As the viewer approaches the fountain from each direction, a separate and deliberate sequence of revealment occurs . . . and at each level of view, an entirely different effect is experienced."

The outer edges of the Hildreth Garden are defined by a long, shielding berm along the south border and a smaller berm at right angles to the first on the west, creating a room effect. Through an opening between mounds, looking to the west from the fountain, the mountains can be seen in the distance. Red sandstone flagstones, in a pattern radiating westerly from the fountain, create a patio area. Soil areas adjacent to the patio will be planted with flowers continuing the pattern.

East of the pool is a raised walkway over which a specially-designed arbor, consistent with the garden plan, is to be constructed in 1976. Writes Mr. Schaal, "The landscape around the fountain is intended to produce a definite spatial or room-like effect. The earth berms are major components in defining the room, and the tree plantings further articulate the space."

Plots of peonies, gladioli, lilacs, and dwarf conifers will complete this section of Botanic Gardens.

The West Gatehouse, providing an entrance into the Botanic Gardens from Cheesman Park, was built during the year. Designed by Victor Hornbein, it is a long, low structure of concrete and white stucco nestling beneath the trees along the boundary between the two areas. Walks in the park leading to the gate are of the same design as those leading to the gate on the Botanic Gardens side.

The ornamental iron grill fence surrounding the east part of the garden was completely rehabilitated during the year. New supporting metal posts were welded to the bases of old, corroded ones; sections of the fence were properly welded to each other and to the supporting posts; individual bars of the fence have been straightened, and the fence repainted. The whole east side of the garden is improved in appearance by this renovation.

The operation of Greenhouses 3A, 3B, and 3C was improved by the division of a single vent along the west side of Greenhouse 3 into three vents, each working independently of the others. Large polyethylene tubes installed just below the ridge vents in Greenhouses 1 and 2, connected with powerful blowers, provide a quite even distribution and movement of air in these two houses. New plastic light fixtures have been installed under the plena which run along the north and south sides of the interior of Boettcher Memorial Conservatory to replace older metal fixtures which were rusting.

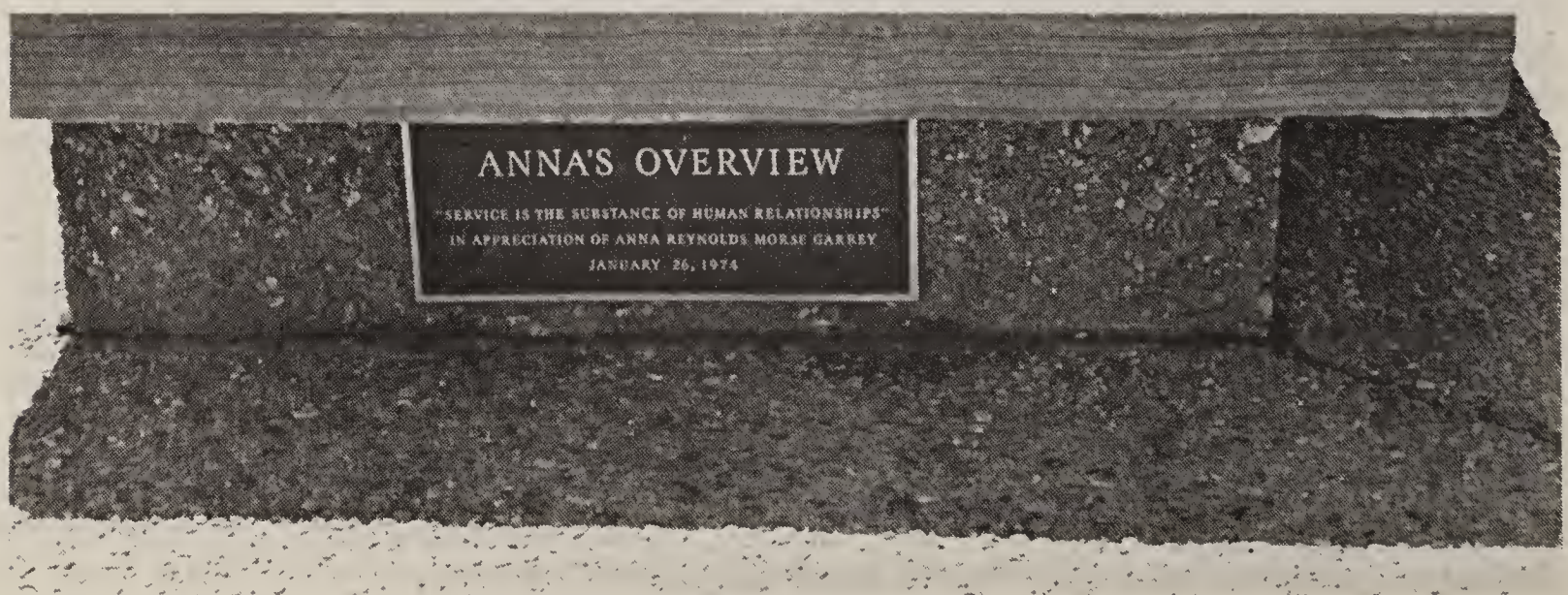
The shade house on the south side of the greenhouse tunnel was converted into greenhouse use by the application of fiberglass panels to its top and sides, adding 12,000 square feet of space badly needed to grow and over-winter annuals.

Rehabilitation of the Lew Hammer Garden, a demonstration home garden contributed and constructed by Lew Hammer, was done in 1975 by the Garden Club of Denver, following a design of Alan Rollinger. New shrubs were planted and new architectural features such as a Japanese type dry stream bed were added.

Addition of a new section more than doubled the size of the Herb Garden. This is a project of Denver Botanic Gardens Guild and was designed by Jane Silverstein Ries. Additions in 1975 included the erection of handsome stone benches in the extension as a memorial to Mrs. Frank McLister, the installation of an unusual stone sundial as a memorial to the late Mrs. Persis Owen, the construction of walkways and new beds, and the installation of an automatic sprinkler system. Planting of shrubs on the berm separating the Herb Garden from the walkway leading to it from the parking lot was done in the spring, as was the planting of herbs in the beds. A few trees are to be added to the area of the shrub plantings.

In the spring of 1975 the Demonstration Vegetable Garden, an entirely new feature, was laid out and constructed. An area of 2,500 square feet was devoted to the demonstration of how to grow various types of garden vegetables. Railroad ties were used to create a garden on three levels which will provide better control of soil and drainage. It is bordered by a fence on which several varieties of apple and pear are to be grown as espaliers.

Improvements at Botanic Gardens House during the year included new floor covering in the kitchen and adjacent areas and painting the walls of these same rooms. Iron safety railings were installed near the front and back entrances to the house.



Plantings and Acquisitions

During the spring of 1975 the gardening staff planted over 1,200 trees and shrubs. They were placed primarily in the eastern one-third of the Gardens, and included 12 varieties of flowering trees, 6 varieties of shade trees, 27 varieties of shrubs and 28 varieties of evergreens.

Some of the more unusual plants received were: Swiss Stone Pine (*Pinus cembra* L.), Harry Lauder's Walking Stick (*Corylus avellana* L. var. *contorta* Bean), Hahs American Cranberrybush Viburnum (*Viburnum trilobum* Hahs), Fragrant Snowball Viburnum (*Viburnum carlcephalum* L.), Red Bud (*Cercis canadensis* L.), Thompson's Blue Spruce (*Picea pungens* Engelm. var. *glauca* Thompson), and Temple Scotch Pine (*Pinus sylvestris* L. var. *fastigata* Carr.).

The display of annual flowers was much expanded in 1975 when more than 28,000 of them, all raised in Botanic Gardens greenhouses, were set out on the grounds. Among the unusual varieties in the display were: Castor Bean (*Ricinus zanzibaricus* G.M. Popova), *Salpiglossis* Ruiz & Pav. 'Splash', and *Gaillardia* Fouger. New in 1975 were pansy 'Imperial Blue', zinnia 'Scarlet Ruffles', marigold 'Show Boat', and petunia 'Summer Sun'.

A Gladiolus All-America test bed was established in an area adjacent to the Rose Test plots. Denver Botanic Gardens is cooperating with the Gladiolus Society in this endeavor. Potential new varieties of gladiolus will be grown under test conditions. The Society will provide all the test materials on which records will be kept and forwarded to national headquarters in the fall. The Society will also furnish demonstration corms of previous All-America award winners, to be grown in the same garden. Twenty-five varieties of these award winners were received and planted in 1975.

The Dahlia Garden, initiated in 1974, was changed and improved in 1975. Four plots were enclosed in railroad timbers, two levels in height. Unsatisfactory heavy clay soil was partially removed and mixed with top soil containing organic matter, raising the soil level about 14 inches and providing better drainage. A total of 329 plants, of 163 varieties, was placed in the plots. A hedge of cotoneaster encloses the garden.

The Rose Display Garden was redesigned and replanted during the year. Extensive soil preparation was necessary for the planting of 490 bare root plants of excellent varieties given to Denver Botanic Gardens by Weeks Wholesale Rose Grower of Ontario, California. This brings to completion more than half of the display beds.

A total of 132 roses was planted in April in the All-America Rose Selection test garden. They are to be retained for a two year testing program.

The Iris Garden, which includes tall bearded, standard dwarf bearded, intermediate bearded, border bearded, and miniature dwarf bearded iris, continued to grow larger. There were 31 new additions this year, bringing the total number of plants to 312. Twenty-two additions were made to the Siberian iris collection which now has a total of 59 varieties. There are 52 varieties of spuria iris.

Twenty-two new varieties were added to the hemerocallis garden during the year, making a total of 378 different varieties on display.

A new area was selected for the peony garden and twenty-two new varieties were planted. These plants were donated by Klehm Nursery of Arlington Heights, Illinois.

Twenty-nine varieties of chrysanthemums were planted in the fall.

Fourteen new varieties were added to the water plant collection which now has a total of 33 varieties.

The impressive total of nearly 40,000 spring-flowering bulbs was planted at the Gardens in October and November of 1975. Of these, 23,600 bulbs — narcissus, hyacinth, muscari, and tulips — were gifts of the Netherlands Flower-bulb Institute. There were 9,000 hyacinths, 5,000 daffodils, 10,000 tulips (49 different varieties). The

bulk of the tulips and daffodils was planted along the south side of the conservatory. The hyacinths were planted around the flagpole area and along York Street north from the east gatehouse.

The plantings included another 16,000 tulips and daffodils purchased by the Gardens. Tulips and hyacinths were planted in alternating bands of red, white and blue in recognition of the Bicentennial Year.

Over 600 new plants were added to the conservatory and greenhouse collections in 1975. Included in these were 76 cacti and succulents, 212 orchids, and 16 insectivorous plants. The cacti and succulents were installed in permanent displays at the upper or west end of the conservatory, in both the northwest and southwest corners. These natives of the warm, dry desert regions add an entirely new aspect to the tropical displays. The insectivorous plants were housed in a new glass exhibition case on the balcony in the lobby of the Boettcher Center. This display has been especially popular with visiting school children.

Testing of Plants

A wide range of plants is currently being tested in the propagation area. Some of these show promise: others, doing well now, will need more severe winters before their hardiness will be determined. This activity is one of the primary purposes of the Gardens and will become increasingly important in the future.

As the first Plant Dividend offered by the Botanic Gardens, over 850 plants were distributed to members.

Plant Sale

Again, the annual plant sale in May broke records for attendance and the amount of money taken in. Thousands of visitors filled the Boettcher Center building and sale area to the north and west of it, eagerly selecting their purchases from the hundreds of top-grade plants grown and purchased especially for this sale. Higher costs held the relation of expenditures to profits to the level of other years. Cooperation from growers and suppliers was excellent, and the more than 400 volunteer workers whose efforts made the sale possible did a superb job.

Lobby Court Display

The Lobby Court Display is seen and admired by almost every visitor to the Gardens. The year started with the lovely poinsettias, followed by the vibrant reds of Rieger begonias. In March came Easter lilies, cinerarias, and cymbidium orchids; then the spring bulbs — tulips, hyacinths, and daffodils — interspersed with calceolarias. At Plant Sale time many ferns, bromeliads and others from the Greenhouse collection were on display. Next came the velvety blooms of gloxinias and again a begonia planting; this time, in addition to Rieger, wax, tuberous and rex were also shown. In August fuchsias and impatiens, backed by podocarpus and other green foliage plants, were admired. The fall chrysanthemum display around the pool in the Lobby Court was without doubt the most colorful yet produced by the Gardens. Over 100 varieties, grown in Botanic Gardens greenhouses, were in their glory, showing much diversification in color, size of plant and of bloom, and type of flower such as spider, spoon, exhibition incurve, reflex, pompom, saga, and others. Large hanging baskets, suspended from the ceiling, added a spectacular note to the display. At the end of the year the poinsettias in banked masses, featuring two unique poinsettia trees, returned. Staff members who grew the plants and prepared the displays outdid all previous efforts in 1975.

Children's Garden

The Children's Garden program at the York Street unit began, in 1975, its 16th year with 126 children (63 beginners and 63 advanced) enrolled. Irene Vittetoe (Mrs. John M.) again served as instructor. Indoor instruction classes were held in April. Outdoor gardening began in early May. A highlight of the summer program was a Garden Fair in August where the children exhibited their best vegetables. Certificates for successfully completing the program were issued to 123 children at the graduation program held in early September.

After several years of planning and effort, a "branch" Children's Garden was successfully established on the grounds of Barrett School in northeast Denver at 29th and Jackson Streets. Under an agreement with the Board of Education, Denver Public Schools, a strip of land 510 feet long and 65 feet wide which parallels the large playground at that school was converted into a garden known as the Children's Garden of Walnut Hill. Financed by private donations, the Gardens placed a chain link fence around the whole area, installed a watering system similar to that at the Botanic Gardens Children's Garden, and erected a small storage shed.

Seeds, plants, and tools, and an instructor (Mrs. Vittetoe) to direct the work were also furnished by the Gardens. A particular effort was made to get parents involved, and the response has been most gratifying. Thirty-eight children from Barrett and Columbine schools, in the 4th, 5th, and 6th grades, were enrolled, each of them working in a 10 by 10 foot plot. Another section of the garden is serving as a "community garden," tended primarily by the parents, the harvest from which will be shared equally by those doing the gardening. Only about half of the total space is being used this year. Our plan is to make it possible for about 125 children (ages 9 to 15) to have individual gardens next year. With the help of qualified parents, working with minimum supervision and advice from the Botanic Garden staff, we are looking forward to assisting the citizens of the area to make this a permanent project and a genuine contribution to community education in horticulture.

The Board of Trustees has authorized the establishment of still another garden for young people at a slightly higher age level than those in its Children's Garden program. This one is to be located on the lots currently being maintained, but not in active use, at the corner of York Street and 11th Avenue. A private donation was received to help further the new undertaking.



Children's Garden

Chatfield Arboretum

All the necessary papers have been signed and the U.S. Corps of Engineers has officially approved a lease to the City of Denver for nearly 750 acres of land in the Chatfield recreational area, on the west side of Highway 75. The lease will run from July 1, 1975 to June 30, 2000. Botanic Gardens will create an arboretum on this land. The Corps of Engineers has completed hard-topping the entrance road to the Deer Creek area and to the parking lot there. Active planning of the arboretum is now proceeding.

Using private funds, Botanic Gardens has provided a mobile home in the Deer Creek area of the arboretum site, occupied by two men (one an employee of the Gardens) to provide security against vandalism and to begin clean-up and restoration work there.

About 25 perennials were transplanted to the arboretum site from the York Street Unit. These were older varieties, moved to make space for newer ones.

Education Program

Each year the botanical and horticultural courses offered at Denver Botanic Gardens become more popular. In 1975 the enrollment for courses was limited and most were over-subscribed soon after their announcement. Members and friends of the Gardens recognized the value of the instruction given by regional experts in all the subjects offered. The titles listed suggest what can be learned here. Members receive quarterly schedules of the educational courses together with a registration form.

Horticulture: Home Landscaping (Mr. Rollinger and Mr. Watson), Hobby Greenhouses (Mr. Briggs), House Plants, three classes (Mr. Hannigan, Mr. Lankhorst, Dr. Zeiner), Annuals (Mr. Park), Vegetable Gardening, two classes (Mr. Hannigan, Mr. Latta), House Plant Clinic (Mr. Lankhorst), Care of Perennials (Mr. Gundell), Pruning (Mr. Park), Cacti (Mrs. Simmons), Mineral Water Gardening (Mr. Novitt), Chrysanthemums (Mr. Blue), Forcing Bulbs (Dr. Zeiner), Gardening Under Lights (Mr. Woodward).

Botany: Plant Communities (Dr. Denham), General Botany (Dr. Hugh Wingate), Basic Taxonomy (Dr. Brunquist), Identification of Common Mushrooms (Mr. Grimes).

General: Dried Flower Arrangements (Mrs. Kosanke), Herbarium (Dr. Zeiner), Use of Library (Ms. Huggins), African Violet Workshop (Hi-Hopes Study Club), Rose Symposium (Rose Societies), Bottle Gardens (Mr. Hannigan), Canning and Freezing Garden Produce (Ms. Anderson), Techniques of Drying Flowers (Mrs. Kosanke), Elementary and Intermediate Bonsai (Mrs. Neal), Christmas Swags (Mr. Ashley), Traditions of Holiday Plants (Dr. Jackson).

Field Trips: Monthly Plant Identification Field Trips, from March to September (Dr. Brunquist), Chatfield Dam Area (Mrs. Echelmeyer, Mrs. Shepherd), Adams County Nature Preserve (Mr. Neiderkorn, Mrs. Steele), Pawnee Grasslands (Mr. Cowgill), Cheesman Park (Mr. Hostetler), Mt. Goliath, 3 times (Mrs. Ash, Mrs. Shepherd), St. Mary's Glacier (Mr. and Mrs. Turnure), Plants of the City (Miss White), Art Museum (Museum Staff), Florissant Fossil Beds (Mr. Kanski), Outside Gardens, Denver Botanic Gardens (Mr. Park), Tree Walk, Washington Park (Dr. Gambill), Applewood Seed Company (Mr. and Mrs. Milstein), Governor's Garden.

Children's Program: The Gardens offered six classes in conjunction with the National Junior Horticulture Association.

Lectures: Slide Show by Lucian Long on *Colorado's Wonderland of Flowers*. Jointly sponsored lecture by Botanic Gardens and Colorado Mycological Society, Dr. Alexander Smith on *Mushrooms*.

Films: Films on nature and gardens were shown monthly except in May to an average attendance of 25 persons.

Guides: Mrs. Hayward taught two guide classes, and volunteers conducted tours of the Conservatory for over 9,200 visiting school children.

Use of Facilities

The steady growth of interest in, and use of, Denver Botanic Gardens continued in 1975. A turnstile count at the East Gateway showed 234,334 visitors during the year, a new record. Meetings, lectures, programs and shows in Horticulture Hall were attended by 14,103 persons. Attendance at classes and meetings in the lecture rooms of the Education Building reached 10,610, while 5,470 persons attended meetings in Botanic Gardens House. Several hundreds attended such events as the African Violet Workshop, meeting of the Institute of International Education, Rose Symposium, Parks and Recreation Program, African Violet Show and Sale, Colorado Water Color Exhibit, and the Children's Garden Fair and Graduation. Visitors numbered in the thousands at each of the following: Annual Plant Sale, Gift Shop Christmas Sale, Iris Society Show and Sale, Denver Bonsai Club Show and Exhibition, Gladiolus Society Show and Sale, and the Dahlia Society Show.

And still they come, more and more each year, as the popularity of the Gardens continually increases.



Plant Sale

Publications

The lively and learned quarterly magazine of Denver Botanic Gardens, *The Green Thumb*, again presented a variety of horticultural, botanical, and historical articles, ranging from "A Garden for Molly Brown" and "Early Colorado Botanists" to such thorny subjects as "Russian Thistle" and "Getting Acquainted with Cacti." In October, due to the press of other commitments, co-editors Dr. Janet L. and Dr. F. H. Wingate resigned. Dr. Patricia Smith edited the winter issue. The Wingates edited the Annual Report for 1974.

A new Visitor's Guide for the Gardens was published during the year. Bernice Petersen (Mrs. J. V.) wrote the text and Dr. Janet L. Wingate (Mrs. F. H.) made the illustrations.

The 8th printing of Walter Pesman's *Meet the Natives* came from the press in 1975, demonstrating the continued popularity of that classic.

Margaret Sikes continued to edit competently, reliably, and cheerfully, the monthly *Newsletter*.

Eileen Bloustein, working with Beverly Nilsen, continued, in a spritely manner, to publish the *Jolly Green Gardener* for junior members.

These are the people who are strengthening Botanic Gardens' reputation for fine publications.

Helen Fowler Library

"Growing" is again the word to describe the Helen Fowler Library.

During 1975, 735 books were added to the collection of the Library, to bring the total number of books in the collection to 6,242. This is a 13 per cent increase in one year.

Of the new books, 108 were purchased by the monthly donation from the Associates of Denver Botanic Gardens, 137 were purchased from the proceeds of the annual book sale, 61 books donated for the book sale were placed in the Library collection, and 36 were purchased with the money collected as overdue fines. More than half of the Library accessions in 1975 was composed of the 425 books donated or purchased through the generosity of garden clubs, plant societies, companies, and individuals. Six more books came to the Library as memorials.

The Library was a busy place. It was host to 27,613 people during the year. 11,056 of whom used its books and services in some way. The number of books circulated rose to 6,311, and 283 of its pamphlets were used. The phone rang frequently as 3,466 calls for information were received. Volunteers are indispensable to the operation of the Library and in 1975 those volunteers put in 4,575 hours of work. New memberships in Denver Botanic Gardens, originating in the Library, amounted to 248. The staff joined with the greenhouse staff in answering the flood of calls for information from "Dr. Green."

"Doctor Green"

Perhaps no Botanic Gardens program is increasing in public interest and value as fast as the "Dr. Green" service inaugurated in 1974. Each Tuesday and Thursday, for two hours in the afternoon, staff members with sufficient expertise answer the plant and gardening questions of all who call or come to the Helen Fowler Library. Already "Dr. Green" receives an average of 40 calls daily, and at each two-hour session sees about 10 plants brought in to be identified or have their ailments diagnosed. The large number of calls and drop-in clients at all times so interrupted the regular work of staff members that it was found necessary to establish the limited hours for the question period.

Kathryn Kalmbach Herbarium

Work on mounting and incorporating specimens into the herbarium continues, with the main project in 1975 the completion of the specimens donated by Dr. E. H. Brunquist. Many of these were identified by Dr. H. D. Harrington.

The display balcony continues to attract visitors. Seasonal displays of fresh materials, changed weekly, are valuable aids in plant identification. Other exhibits of a more permanent nature are changed periodically.

During the summer, many persons bring plants to the herbarium to ask for help in identifying them. Several slide collections have been identified.

High school classes come to learn about the Herbarium and to learn how to prepare and mount specimens.

The Herbarium is supervised by Dr. Helen Zeiner (Mrs. Fred), Honorary Curator, assisted by Marjorie Shepherd and other volunteers. It is open each Tuesday and, by appointment, at other times.

Mycology Laboratory and Herbarium

Under the direction of Dr. D. H. Mitchel, Honorary Curator of Mycology, the Mycology Laboratory and Herbarium grows vigorously in the areas of research, education, and community service.

During 1975 approximately 1,000 more specimens were added to the Mycological Herbarium. These have been described and studied microscopically, indexed, photographed, and stored for further study. About 300 of these are Myxomycetes. Specimens have been exchanged with the herbaria of the University of Michigan at Ann Arbor, the University of California at Chico, the University of North Carolina at Charlotte, the State University of Virginia at Blacksburg, and the U.S. Department of Agriculture Fungus Herbarium at Beltsville, Maryland. Our herbarium has been approved for listing in the International Directory of Herbaria published in Amsterdam and a preliminary application has been made to obtain a federal grant for the herbarium. Ongoing projects include an intensive study of the Myxomycetes and Gastromycetes of Colorado, as well as a study of *Armillaria* species in the Rocky Mountains.

Publications in 1975: "Studies of *Disciseda* (Gastromycetes) in Colorado," *Mycologia* 67(3):586-596, May/June 1975; "Notes on Colorado Fungi I — *Hygrophorus amarus*," *Mycologia* 67(3):672-674, May/June 1975. Denver Botanic Gardens paid for the cost of printing these two articles in *Mycologia*, and for reprints of them.

Also: Revised Edition of *Pois-Index* Section on Mushroom Poisoning in conjunction with the Rocky Mountain Poison Center, May 1975.

A number of other important works were prepared during the year for future publication.

The Curator has continued to be active as a Trustee of the North American Mycological Association and has served as Chairman of the Toxicology Committee of that organization, participating in a course and conducting a seminar at the National Foray in New Hampshire in September. He has actively served on other committees and projects.

High School Internship Program

This year the Denver Botanic Gardens participated in the Executive High School Internship Program of the Denver Public Schools, in which superior high school students are assigned to a public agency to work eight hours a day, four days a week,

throughout a school semester. The Denver program, part of a national program, is designed to allow students to test their capabilities and explore their interests.

Daniel Brownson, an East High School student, came to the Gardens in September and worked in all aspects of the Gardens under the direction and supervision of the director, who served as his sponsor. Dan was a willing worker and made friends throughout the organization. On Fridays, after his four-day stint at the Gardens, Dan either took part in seminars with other interns in the program or attended meetings at his own school.

Other students will come to the Gardens as interns for a semester in the future.

Personnel

Mr. Lee (D.H.) Schwade, a native of Denver, was appointed Botanist-Horticulturist on the staff of Denver Botanic Gardens in the summer of 1975. He is a graduate of East High School and of Regis College, where he received a Bachelor of Arts Degree, *Cum Laude*. Following his graduation from Regis, Mr. Schwade taught biological and physical science at Holy Family High School in Denver. Later he obtained his Master of Arts degree in Biological Science from the University of Northern Colorado, and completed the curriculum in Urban Horticulture at the Community College of Denver.

At the Botanic Gardens he was placed in charge of the program in plant propagation, working in close cooperation with Richard Schimming. He has also been assigned to the Children's Garden program where he assisted in the windup of the 1975 season.

All the members of the Botanic Gardens Staff are dedicated, competent, and hard-working, accomplishing wonders in meeting the demands placed upon them as the Gardens grow — as can be seen in the foregoing sections of this report.

During the late fall, the Botanic Gardens selected a uniform which is to be worn by the permanent workers in the outside gardens, the shops, and the greenhouses. The trousers are dark brown, worn with a tan shirt, with the Botanic Gardens logo worn as a shoulder patch. The workers greet 1976 "all dressed up and ready to go."



Award Winners

SILVER JUBILEE

RECORDS PROGRESS

Bernice E. Petersen

In tracing the history of Denver Botanic Gardens on this its Silver Anniversary, one must glimpse the ideas, the ideals, and the accomplishments of many citizens of vision and organizations of action who urged experimentation in horticulture, promoted education and conservation, and fostered use of native plants and adaptability of exotic ones. Those efforts culminated in authorization of Articles of Incorporation of the Botanical Gardens Foundation of Denver on February 3, 1951.

Nearly a century had passed since William Newton Byers, founder and editor of the *Rocky Mountain News*, held the first exposition of grain and vegetables in the *News* office in 1860. An Agricultural Society was formed in 1863 and with the encouragement of Governor John Evans the first territorial fair was held in 1866.

The Colorado State Forestry Association, formed November 19, 1884 and headed by Col. Edward Ensign of Colorado Springs, was probably the second forestry association established in the United States. This early organization urged establishment of forest reserves and asked Congress to adopt legislation to protect the forests of the public domain from destruction. By 1891 President Harrison had signed a proclamation establishing the first timber reserve in Wyoming, the second in the White River Plateau in Colorado. By 1897 Congress had passed an act providing for the organization and management of public forests. The Forestry Association merged briefly with the State Horticultural Society in 1888 but separated in 1891 because, as the minutes stated, their interests were too diverse.

Through editorials Mr. Byers earnestly advocated experiments with fruits, vegetables, and trees in this arid-alkaline environment and by 1900 35 kinds of trees surrounded his residence, now the site of Byers Junior High School. He served on the first Board of Managers for the State Forestry Association and was its president at the time of his death in 1903.

Among the many prominent citizens in the Forestry group were Walter Cheesman and Henry M. Porter. Anna R. Garrey (Mrs. George) wrote, "How little did they dream of the part their daughters, Mrs. John Evans and Mrs. James J. Waring were to play in realizing their early plans for directed research in plant material — resulting finally in a botanic garden in Denver!"

In 1910 Saco R. DeBoer, a Dutch immigrant, went to work as an engineer and horticulturist in the Denver Parks Department under Mayor Robert W. Speer. Planning and landscaping of Denver's parks had been under way since 1894 with Reinhard Scheutze as landscape architect.

As Mrs. Garrey so aptly wrote, "The practical horticulturist Mr. DeBoer, whose interests were soon to embrace a wide field — city and community planning — found his place under the leadership of Robert Speer. To these men of vision the orderly development of a rapidly growing community was of utmost importance. The needs seemed limitless — in extensive planting, what trees and shrubs would survive in this semi-arid land?

"In earlier years our pioneers had realized this need and now Saco DeBoer brought new realization of a way to fulfill this need — a botanic garden. With missionary zeal he spread his conviction"

He joined the Colorado Forestry Association, hopeful that his efforts would become more effective and served as president for many years until pressures of business forced his resignation in 1934. As the government assumed more responsibility for the forests and as interest in horticulture increased, a new group, The Denver Society for Ornamental Horticulture, was formed in 1916. Mr. DeBoer was its second president and also edited its bulletin *Garden Hints* for many years.

In the interests of horticulture Mayor Speer suggested that a flower show be held in the new city auditorium. With encouragement and sponsorship of The Garden Club of Denver, which helped in financing these shows, Mr. DeBoer spoke with local florists who stripped their greenhouses to give a creditable display. Recently when his biography was being readied for publication, Mr. DeBoer pointed out that Mrs. Garrey was chairman of that flower show in 1919, and in reality it was then that she took up the challenge to seek civic and private funds to establish a Botanic Gardens. Since that early effort her enthusiasm has never diminished.

"Anna Garrey's Overview," an observation site at the present gardens, honors Mrs. Garrey as one of the pioneers in the establishment of Denver Botanic Gardens.

A. Lincoln Fellows was president of the Forestry Association in 1938 followed by M. Walter Pesman, who had been a partner of Mr. DeBoer in a landscape architecture firm. During the depression years Mr. Pesman retained the work of landscaping Denver school grounds and Mr. DeBoer gained prominence as a city planner.

Botanic Gardens Planned

At a meeting of the Colorado Forestry Association in 1941 Kathryn Kalmbach (Mrs. E. R.) presented the following motion:

"Resolved that the Colorado State Forestry Association endorse and aid in the establishment of a Botanic Garden within and adjacent to Denver where various tree, shrub and herb species may be tested. Such a Botanic Garden may not be in one large tract, but many small tracts, located in various zones, extending from the typical Eastern Prairie Zone to Alpine Timberlands. The State Association is not interested primarily in a 'Show Place' within the city limits but in the practical demonstration of the adaptability of the tree, shrub and herb species to various natural zones. Such demonstration tracts may be located on city, state, or federally owned lands, through arrangements made with the proper agencies, and such available lands should be assigned to botanical purposes at any time opportunity is presented."

By 1943 it became obvious that the Colorado Forestry Association as well as the Denver Society for Ornamental Horticulture would both benefit by fusing into a single new group which would be called the Colorado Forestry and Horticulture Association. Mr. Pesman, president, set about establishing a new constitution and bylaws which were written with the assistance of George W. Kelly, Robert E. More, Irvin McCrary, John H. Gabriel, and others. Mr. McCrary, landscape architect and city planner, offered space in his office at 16th and Broadway where the first numbers of *The Green Thumb* were prepared with dynamic Mr. Kelly, nurseryman and naturalist, as editor and acting head.

The first issue of *The Green Thumb* stated among the organization's objectives: "That this Association take the initiative in promoting a Rocky Mountain Botanic Garden. This project has had the consideration of the Association for so many years that there is no necessity here to stress its importance" To that first issue Mr. DeBoer contributed "The Colorado Landscape" in which he emphasized the importance of understanding horticulture here, and the idealist, Mr. Pesman asked, "What will the Rocky Mountain Arboretum give to the world?"



Mrs. John Evans

With the election of Gladys Cheesman Evans (Mrs. John) as president of Colorado Forestry and Horticulture Association, the society entered a new era. She generously provided a headquarters rent free, and in June 1946 the Association moved into a delightful Victorian house at 1355 Bannock Street. (The building, Horticulture House, had been transformed into an efficient unit with book shelves, a director's office, and kitchen facilities.)

Privately supported by special donations, by membership dues and with the assistance of many working volunteers the Association prospered. Mrs. Evans, in her annual reports, stressed the Association's continued efforts to obtain a botanic garden. Among various sites considered were an area near the University of Denver, the old Overland Park (now a municipal golf course), Inspiration Point in North Denver, the Myron Blackmer estate between South Colorado Boulevard and South University Avenue (now occupied by Kent and Denver Country Day Schools). Studies were made of land surrounding the Museum of Natural History — about 100 acres in City Park.

Finally, when it became evident that private funds alone could not bear the financial burden of establishing a botanic garden, Mr. and Mrs. Evans offered to finance the preparation of a detailed plan for a botanic garden in City Park. This plan would be presented to the City with a suggested contract for its implementation through a combination of private and public funds under the management of an unpaid Board of Trustees. The plan, drawn by Mr. DeBoer, was accepted by the city and the Colorado corporation was authorized February 3, 1951.

The first meeting of the Botanical Gardens Foundation of Denver, Inc. was held February 27, 1951 at the home of Mr. and Mrs. Evans. Bylaws were adopted, an

agreement with the City and County of Denver was ratified, an official seal was adopted and the following officers were elected: Mrs. Evans, president, Milton J. Keegan, vice-president, Malcolm Lindsey, vice-president, Mrs. Garrey, vice-president, and Dr. Moras L. Shubert, secretary-treasurer. Executive Committee Members were the officers listed and Myron K. Blackmer, Mr. DeBoer, William H. Ferguson and Hudson Moore, Jr. Charter Trustees besides the above were Charlotte Barbour (Mrs. A. L.), William H. Ferguson, George Kelly, Robert E. More, Dr. Robert L. Stearns and Ruth Porter Waring (Mrs. James J.). Ex-Officio members were Frazer Arnold, President, Denver Zoological Foundation, Fred R. Johnson, President, Colorado Forestry and Horticulture Association, Mr. Moore, Jr., President, Museum of Natural History, and Mayor Quigg Newton.

City Park Garden Begun

Work began promptly. An interesting feature of the plan was a rocky canyon simulating high mountain terrain. This was built to the southwest of the museum. Large boulders were brought in — a generous gift of the Charles Gates family. From this height a stream meandered through the meadow ending in a lily pond. Alpine plants were to be planted in the canyon followed by plantings typical of each succeeding zone. A conservatory was included in the design and plantings of various tree, shrub and herb species were indicated. What a fascinating idea!

Enthusiasm soared. By 1954, in a progress report to CF&HA the following plantings were listed: Milton J. Keegan — French hybrid lilacs; S. R. DeBoer — a collection of 47 flowering crabapples; Robert E. More — a unique gift of 250 varieties of evergreen in a pinetum located south of the Museum. Helen Fowler (Mrs. John) gave a collection of ferns; the Denver Rose Society sponsored plantings of 4,000 roses; District 20 of the American Iris Society with Dr. John Durrance and LeMoine Bechthold as planners, planted a rainbow iris garden and the latter, who had developed numerous hybrid daylilies including the first spider form, provided a collection of hemerocallis. The Men's Garden Clubs of Colorado planted 36 varieties of flowering cherries, plums, apricots and peaches.

Mr. Kelly served as director and coordinator (as well as director of CF&HA) until Robert Woerner, a landscape architect and horticulturist from Spokane, Washington, was selected by the Trustees and the City to direct the Gardens full time. Office space was provided at the Museum.

By 1958 Mr. Woerner reported that 1,000 species and varieties of plants were growing at City Park and an Alpine Tundra Study Area had been set aside on Mt. Goliath about 50 miles from Denver. Established by permission of the U.S. Forest Service and jointly maintained with them this outpost consists of 160 acres ranging in altitude from 11,500 to 12,150 feet with a spectacular timberline forest of bristlecone pine (*Pinus aristata* Engelm.). A 2-mile trail, named in honor of Mr. Pesman, leads visitors during summer months on a self-guided tour to study and enjoy plants typical of the Arctic.

Plant data have been compiled and published. A Mt. Goliath folder describing alpine tundra and lichens, is offered at Botanic Gardens Gift Shop and at the Idaho Springs Ranger Station.

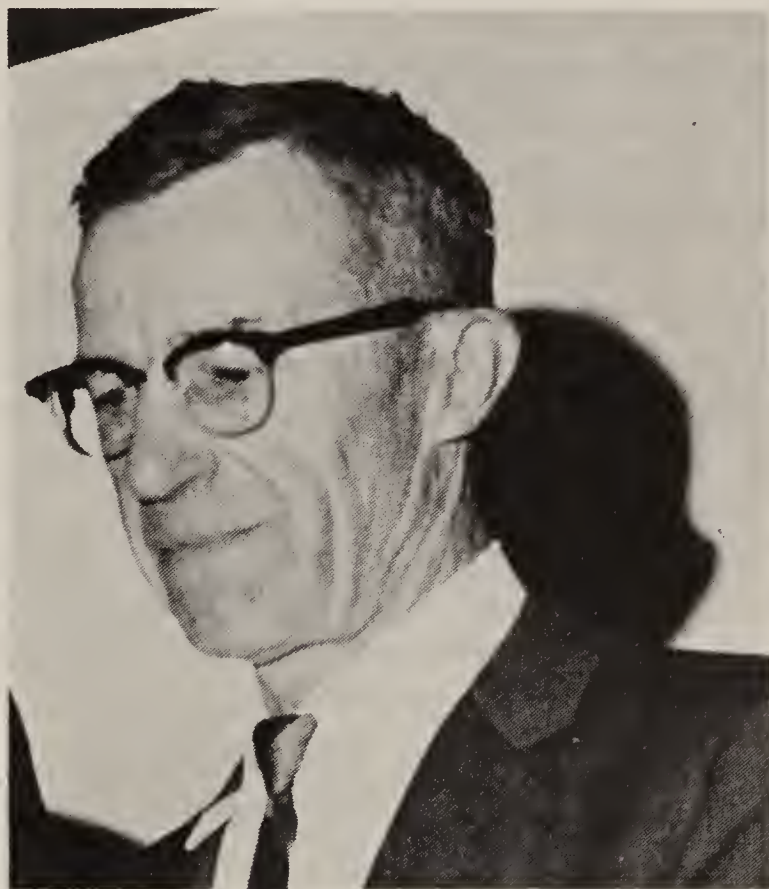
Another important plateau was reached during 1958 when the Botanical Gardens Foundation of Denver was granted permission to begin development of an herbaceous unit on York Street. What caused a change of plan and location?

Mrs. Garrey reported in *The Idea Precedes the Accomplishment* that the Botanic Gardens Trustees were soon confronted by a serious problem. Depredation in the herbaceous sector at City Park was incredible. Vandalism was rampant and effective policing was impossible. "The subsequent necessity to abandon this original plan and remove the Gardens' headquarters remains a sad comment on our times."

Botanic Gardens House Given

At this point Dr. and Mrs. James J. Waring offered to purchase a headquarters building at 909 York Street adjacent to an 18 acre plot once occupied by Mt. Calvary Cemetery but now owned by the City. On September 21, 1958, *The Denver Post* reported that the "Normandy residence" of the Elmer Hartner family would become the headquarters of the Denver Botanic Gardens Foundation. The transfer of ownership was consummated early in 1959 and on April 1 the Botanic Gardens House was opened, dedicated as a memorial to Mrs. Waring's father, pioneer businessman and philanthropist, Henry M. Porter. A residence from 1923 to 1958 the building, with its distinctive architecture, designed by Jacques Benois Benedict, and with remaining original decor, was designated a Denver landmark in 1973 for historical preservation. As Virginia McConnell Simmons (Mrs. George C.) wrote, "Rarely have beauty and utility been so happily joined as in the Denver Botanic Gardens House."

Besides the administrative office the House was used for meetings, teas and conferences, for research and educational activities. The Helen Fowler Library was located in the library while the Kathryn Kalmbach Herbarium of dried plant specimens was stored in linen closets on the second floor. Space was allotted for the Colorado Federation of Garden Clubs headquarters as well as CF&HA, for Horticulture House had been razed to make way for the University of Denver Law Building. Eventually an additional building was planned to house an auditorium and classrooms with space for flower shows and all types of horticultural activities.



Mr. George Kelly

Since funds for developing the new York Street unit were limited, the various segments of the horticultural community united in one giant effort to hold a Garden Show and Fair to raise money toward this shared goal.

With Marnie Epich Honnen (Mrs. E. H.), chairman, and Patrick J. Gallavan and Mr. Woerner, directors of the sponsoring organizations, as co-chairmen, the first Garden Show and Fair was held at the University of Denver Field House May 16, 17 and 18, 1958. An immense naturalistic rock garden, focal point of the show, was developed by Sam Huddleston, representing the landscape architects, together with Mr. Kelly, now a nurseryman and landscape planner, and Lew Hammer, landscape contractor. Federated garden clubs prepared seven model gardens, commercial exhibits and educational

displays dotted the perimeter. The Home Garden Club of Denver, a non-affiliated group, sponsored an open competitive flower show along the balcony and commercial florists contributed distinctive floral displays. The Garden Club of Denver sold unusual hand-decorated and other gift items and the annual plant auction climaxed the affair. Cooperation and good fellowship abounded. Profits were \$5,273 and were divided between the two sponsors.

Botanic Gardens, Inc. Formed

Since CF&HA was privately supported and faced financial difficulties it seemed expedient to fuse this group with the Botanical Gardens Foundation, which received some support from the City. In November 1960 Scott Wilmore, president of CF&HA and Lawrence Long, president of the Gardens, in a joint statement announced the two organizations were at last one. Mr. Long was president of Denver Botanic Gardens, Inc. Mrs. Waring was named vice-president, John C. Mitchell, treasurer, and Mrs. Garrey, assistant secretary-treasurer.

Dr. Aubrey C. Hildreth, who had retired as director of the U.S. Department of Agriculture's Experimental Station at Cheyenne, Wyoming became director of the Gardens in 1959 and at the official dedication ceremonies Sunday, September 20, 1959 he predicted: "Denver has great possibilities for developing something unique among botanic gardens of America, or in fact, of the world. Our high mountains, so near at hand, have a great variety of climatic conditions, representing everything from here to the Arctic region. With these mountains for growing cold-loving plants, the units in the city for temperate zone plants, and the Conservatory which is planned for this unit of the Gardens for growing tropical and sub-tropical species, it will be possible to have in this vicinity for study and exhibition a complete cross-section of the plant kingdom, from the equator to the polar regions. Few large cities of the world have this opportunity."

Development of the grounds took form, walls and fencing were installed to afford protection. Staff for administration and maintenance was increased. The Rocky Mountain Chapter of the American Society of Landscape Architects offered their services in designing the landscape planting for the Herbaceous Unit on York Street. Five Denver members donated their time: Gerald F. Kessler, Andrew Larson, Frances White Novitt, Mr. Pesman and Jane Silverstein Ries (Mrs. H. F.), Ed Wallace and Mrs. Novitt were employed for the final drafting of the planting plans.

In accordance with Dr. Hildreth's suggestions, stone and concrete work between York and Josephine were scheduled for completion the following spring, a Children's Garden Program should occupy first educational priority and garden clubs would be invited to develop areas in the Gardens subject to the Director's approval. A first essential, a pickup truck, was donated by the Men's Garden Club of Denver. The Children's Garden program became reality with a group of boy and girl scouts pioneering this effort. Working in teams the children planted and maintained their own garden plots with parents as volunteer supervisors. A Children's Shelter, a covered patio, garage, space for storing garden tools, and restrooms were dedicated December 7, 1960, a gift of Mrs. Waring. For her very generous support and encouragement in the development of the children's garden program and of Denver Botanic Gardens the children's garden was named the Ruth Waring Children's Gardens.

The Terrace and Garden Tour, featuring eight attractive gardens with adjacent garden rooms or patios shown in a single day, was held in June 1960. Sponsored by The Garden Club of Denver, Anne Weckbaugh (Mrs. J. Kiernan), chairman, reported the earnings, \$2,010, would be used to assist in the development of Denver Botanic Gardens.

In 1951 Daisy Hastings (Mrs. Paul) had originated the idea for "Look and Learn Garden Tours" to benefit CF&HA. She lined up gardens in various sections of the city for tours in spring, summer, and early autumn. Sue Johnson (now Mrs. George Kelly) was responsible for garden experts and ticket sales. Most of the gardens selected were maintained by their owners who were often on hand to share their particular techniques. Spirited by Denver's Rush to the Rockies in 1959, Mrs. Barbour and Frances M. Catherwood (Mrs. Hugh) chose 13 gardens owned by descendants of Denver's pioneers. In subsequent years the Annual Terrace and Garden Tours have been the effort of The Garden Club of Denver, the Perennial Garden Club, and Denver Botanic Gardens Guild serving jointly or singly. More recently members of the Guild select the gardens, sponsoring the project to benefit DBG and the Herb Garden.

A planting of 100 miniature roses in 16 varieties by members of Home Garden Club of Denver was recorded in *The Green Thumb*, July 1960. Many of the participants had been active in CF&HA, herbarium, library, membership, garden tours, editorial committee, and garden fairs. Their craft workshops provided decorations and favors for dinners and sales. With the merging of DBG and CF&HA, 20 of these dedicated volunteers would offer their services as members of Around the Seasons Club which was formally organized January 19, 1961 with Katharine B. Crisp (Mrs. William H.) as president.

During those first years at the York street site Park Floral Co. of Englewood donated services and greenhouse space for more than 7,000 annual plants. District 20 of the American Iris Society planted additional irises including the Randolph collection of dwarfs and intermediates. The Netherlands Flower—Bulb Institute sent 7,750 spring flowering bulbs for test and the Denver Dahlia Society planted 250 dahlias all properly staked and labelled. The Colorado Gladiolus Society planted 8,000 corms including some 5,000 seedlings provided by Alice Wood and Lee J. Ashley. Colorado Cactophiles gave indoor and outdoor cacti. The Gardens tested as many as 10,000 common garden annuals within a year including 193 varieties of marigolds, verbenas, petunias, celosias and zinnias. Poppies, daylilies, penstemons, and other herbaceous plants were also tried, including a collection of chrysanthemums originally developed by Dr. Hildreth at Cheyenne. A group of lilacs was donated by Lemoine Bechtold, who also donated some of his seedling daylilies. Jack Withers and Gilbert Wild & Sons also contributed. Local nurserymen and out of state nurseries maintained their enthusiasm as contributors, and the Denver Rose Society continued its interest at City Park as well as providing plants at the new location. DBG was responsible for both locations as well as the outpost on Mt. Goliath.

The Gates Memorial Garden was begun in Autumn 1961. Planning it as a garden for meditation, Mr. DeBoer combined plantings of native conifers, deciduous trees, and shrubs, with rocky cliffs, a waterfall and pool with a meandering stream to depict a bit of Rocky Mountain landscape.

The gardener staff totaled three and Judge Philip Gilliam offered a Juvenile Court Work Program assigned both to Denver Mountain Parks and DBG. Both the youngsters and the Gardens profited as they weeded and cultivated some 20,000 plants.

Flag Day, June 14, 1962 the Colorado Chapter, Daughters of the American Revolution, presented an American flag and a 30 foot tapered aluminum pole.

Utilizing the 3-Rs of simple construction materials — rocks, reeds, and redwood, Lew Hammer donated the first model garden, one designed by Chris Moritz for low maintenance. Work began January 2, 1963. The garden spotlights white fir, limber pine, and ground covers growing near a dry stream bed. Currently undergoing renovation it is a project of the Garden Club of Denver.

About that time the Denver Botanic Gardens Guild (formed in August 1960 as the DBG Junior Committee) undertook a study of herbs and elected to sponsor a model herb garden. The members planted and grew herbs to use in brewing herb vinegar and sold herbs as their part in the Plant Sale and Auction. A traditional bow-knot garden was designed by Persis M. Owen to contain familiar as well as rare varieties of culinary and medicinal herbs and dye plants. The garden was dedicated in 1965 when a statue, *Boy with Frog*, a work of internationally-known sculptress Elsa Ward Hering was donated by Louisa Ward Arps (Mrs. Elwyn) as the focal feature in memory of the artist. Recently an extension of this nationally-recognized garden was completed with a sundial honoring the designer's memory.

Conservatory Funds Given

Dreams of tree ferns and coconut palms in Denver were destined to become reality when a \$600,000 grant was announced by Trustees of the Boettcher Foundation on January 7, 1963. With a conservatory, hundreds of other tropical and subtropical plants would become familiar to people of this region. Here youngsters, amateur gardeners, and students of botany and horticulture might study actively growing plants year-around, either in classrooms or in a living laboratory. Twice Claude K. Boettcher had proposed the gift of a conservatory to the City but neither offer had been accepted in his lifetime.

Earlier the Boettcher Foundation had given \$10,000 for research and preliminary designs for a conservatory-auxiliary-greenhouse complex. Near year's end the Gardens and the City accepted plans by Victor Hornbein and Edward White, architects. Gerald H. Phipps, Inc. was awarded the contract for construction.

Excitement and anticipation were paramount and for the first time Denver Botanic Gardens had a membership drive, under the leadership of Mary Filley (Mrs. Giles) and "Knobby" Brown (Mrs. Mackintosh), both active in the Guild. To be sure, a membership roster had been the very life-blood of CF&HA and was transferred to the merged organization. Although *The Green Thumb*, the voice of CF&HA, had begun as a monthly publication, by financial necessity the number of issues had been reduced gradually to ten, eight, and then six issues and was presently edited by Joseph E. Oppe, assistant to the director. An additional benefit of membership would be a *Green*



Dr. E. H. Brunquist

Dr. A. C. Hildreth

Mrs. George H. Garrey

Thumb Newsletter, offering timely garden reminders and a calendar of noteworthy activities at the Gardens. Marilyn Holmes (Mrs. Hardin), a volunteer, would edit the monthly leaflet.

The year 1964 marked the beginning of construction of the dominant structure in the building plans. Grading got under way January 21, and for months work was mostly underground installing the massive concrete and steel foundation. In all, 116 concrete caissons bear the weight and penetrate the earth about 250 feet. Weaving a lacy pattern in the brilliant blue Colorado sky against the snow-capped Rocky Mountains the interlacing concrete ribbons of superstructure were poured in place in plywood forms supported by a wooden framework. Plexiglas panes were individually pre-formed into a low pyramid to increase the strength of the ¼-inch-thick plexiglas. Not only did this "faceting" afford a jewel-like interest to the building surface but also the panes were designed to channel humidity to the side of the Conservatory thus eliminating the "raindrops on our heads." Installed on the perimeter of the building were 39 fans to keep air in motion with ten additional fans concealed in bases of lighting fixtures to pick up air from the ground surface and blow it out the top of the hollow lamp posts.

An additional auxiliary greenhouse range with adjoining laboratory rooms and space for cool storage of bulbs and other plant material was made possible by a gift from Mrs. Waring. Supplemented by a small allotment from the City and County of Denver, work began immediately west of the Conservatory in late December. Again Phipps Construction was lowest bidder.

The year 1964 was equally significant in another aspect of Denver Botanic Gardens as a cultural asset to the community, for volunteerism at the Gardens took a giant stride.

The first plant auction was held in 1949 in the Greek Theatre at Civic Center for the benefit of CF&HA. Mrs. Barbour and John Swingle had originated the idea. Nurserymen and members donated trees, shrubs, irises, and other perennials. "Antiques" and "Horribles" were additions for a time. Over the years auctions were staged behind Horticulture House, at various shopping centers, as part of the Garden Fairs, and finally at Botanic Gardens House. Profits fluctuated but good fellowship always prevailed.

The year of the tents at Cherry Creek (1957) the Garden Club of Denver offered distinctive arrangements of artificial fruit for sale and various trustees contributed handcrafted items. Clyde Learned personally selected the first annuals purchased at wholesale and sold at retail. Profits reached \$5,000 but a couple of years later fell to \$1,800.



The New Conservatory

In 1964 best plants were chosen from test trials at the Gardens and plants were started from seed by various greenhouse growers. The Guild was responsible for herb sales, members of the Federated Garden Clubs solicited home garden donations and Around the Seasons Club was responsible for ordering and selling all other plants. Volunteers came from the Men's Garden Clubs, Swingle Study Group, the Federation, and the Trustees. Some nurseries offered donations; others consigned items. The Gardens were at their best blooming with 7,600 bulbs in full flower. The event was a sell-out and the auction had been eliminated.

Although the affair was a triumphant success the sale was grossly understaffed. Dr. Hildreth and his assistant, Mr. Oppe, were continually pressured to lead tours of the outdoor gardens. With the opening of the Conservatory imminent, guides would be essential. City Park unit needed more care than the City budget would allow. An outlet for handcrafts as well as books, pamphlets, and other horticulturally related items would be fortunate. Hostesses to greet guests at Botanic Gardens House were needed, and the Library Committee was attempting to be of greater service.

In September 1964 Associates of Denver Botanic Gardens was organized with Fran Morrison (Mrs. Graham), president of Around the Seasons Club, the founder, and "Dusty" Smith (Mrs. Chard) of Denver Botanic Gardens Guild, the first president. This group, the first service group with unlimited membership, offered physical aid and financial assistance. Many from the existing organizations became part of Associates and Associates part of them. A silver tea announced the opening of Botanic Gardens Gift Shop and a Christmas tree sparkled with miniature lights and fresh white Colorado Carnations supplied by the growers. Avalonne Kosanke (Mrs. Robert M.) with a committee of volunteers created additional holiday atmosphere for the first annual pre-Christmas sale.

Anticipation and construction were predominant in 1965. A conservatory superintendent, Ernest Bibee from the Missouri Botanical Gardens, joined the staff to oversee development of the Conservatory. A total of 309 children participated in the Children's Garden program including an off-campus garden at the Retarded Children's Center and another at Auraria Community Center. A series of lectures on botanical subjects was sponsored by the new Education Committee under the leadership of Dr. Wayne Christian.

Conservatory Dedicated

Formal dedication on January 16 of the Edna C. and Claude K. Boettcher Memorial Conservatory was the highlight for the year 1966. Participants in the ribbon cutting ceremony were Mrs. Charles Boettcher II, Thomas G. Currigan, Mayor of Denver, John A. Love, Governor of Colorado, Joe Ciancio, Manager Parks and Recreation, Lawrence Long, President of DBG Board of Trustees, and Chris Dobbins, Chairman of the Boettcher Foundation.

Even before its completion the building had won international recognition for its unique design and unusual structure — the only conservatory in America made entirely of concrete and plexiglas. More than 600 species and varieties of tropical plants had been acquired for growing in our enclosed bit of tropical terrain with naturalistic pools, waterfalls, and jungle plantings — another departure from the classical arrangement of plantings typical of older conservatories.

Two large transport loads of tropical trees, shrubs, and vines had been brought from southern Florida and one from south Texas. Four smaller loads were gifts of the Missouri Botanical Gardens. Other fine tropical plant specimens were donated by commercial greenhouses in this region as well as local indoor plant hobbyists. Volunteers from the four service groups hosted opening ceremonies.

The Gift Shop, managed by the Associates, moved into the foyer of the new building and by year's end Cathy Petersen (Mrs. Charles V.) was chairman of the Gift Shop Committee. The South Room, originally planned as a snack bar, was constantly used for every other purpose including art exhibits, classrooms, and special sales.

Under the leadership of Peg Hayward (Mrs. Phil), 35 volunteers were trained as Conservatory tour guides and during 1966 more than 100 groups were given guided tours. Visitors to the Gardens between late April, (after turnstiles had been installed) through December 31 numbered 163,000.

The first Conservatory Plant Guide, the May-June 1966 issue of *The Green Thumb* magazine, was devoted entirely to the new facility. It described the buildings, plants, maintenance, and numerical identification of over 200 plants.

Guided tours of the grounds were coordinated by Mary Washbourne (Mrs. P. B.). Assisted by eight trained volunteer guides, approximately 800 people were conducted through the Gardens. Labelling of plants began along the Pesman Trail on Mt. Goliath and printed signs describing the ecology and geology of the area were illustrated with line drawings by Suzanne Ash.

Dr. Louis B. Martin, formerly of Los Angeles County Department of Arboreta and Botanic Gardens, became director of Denver Botanic Gardens August 29. The Board of Trustees conferred upon Dr. Hildreth the title Director Emeritus upon his retirement August 31, 1966.

The following year our president, Lawrence A. Long, resigned for health reasons but fortunately for the Gardens his interest has not faltered.

John C. Mitchell accepted the presidency early in 1969 and at a special meeting of the Board of Trustees on February 20 Hudson Moore, Jr. announced an additional grant of \$500,000 from the Boettcher Foundation. Combined with money given by many interested citizens and civic groups this surprise grant assured construction of the education building, the final phase of the master building plan at Denver Botanic Gardens.

Within four months construction was under way. Essentially in accordance with plans by Hornbein and White, approved in 1963, the new building complemented, aesthetically as well as functionally, the fundamental elements of a botanical institution. Slope of the ground permitted making the north part of the building three stories high and yet subordinate to the Conservatory.

Again new realities! But dreams for bringing about completion of a Master Design for Denver Botanic Gardens were only beginning. During Dr. Martin's tenure at the Gardens he continued to press for a master plan for the outdoor gardens. The City was undergoing severe financial restraints, the budget for plantings was withdrawn. Mrs. Barbour offered funds for plantings south of the Conservatory walkways but other needs were vital. An \$850,000 Development Fund Drive was launched. John D. Hershner was general chairman. Division chairmen of the campaign were George Cannon, R. Earle Honnen, James E. Wilson and Alfred A. Wiesner. In all, 125 dedicated volunteers served in this tremendous effort. Pledges were accepted in money, stocks and other property. Gifts were sought as memorials or living tributes. Gifts-in-kind were made by Colorado nurserymen. Heavy equipment would be furnished in various phases of development as well as donations of concrete and other materials. Funds would also be used to acquire land for long-range parking facilities, to expand the Children's Garden program, and to establish a special contingency maintenance endowment fund.

Redevelopment of the York Street unit of Denver Botanic Gardens in accordance with a plan prepared by Eckbo, Dean, Austin and Williams, a leading firm of landscape architects in San Francisco, was begun September 28, 1970. Andrew R. Knauer, the new Assistant Director, arrived shortly after Dr. Martin left to become director of

Brooklyn Botanic Gardens. Mr. Knauer directed the work of contouring earth, of installing elaborate waterways and irrigating systems. In the midst of this construction and reconstruction Dr. William G. Gambill, Jr. returned to his native state to assume the position of director of Denver Botanic Gardens in July 1970.

Education Building Opened

On March 6, 1971 a longed-for dream became reality. The formal opening of the Education Building marked completion of the whole building complex at Denver Botanic Gardens. Cris Dobbins, Board Chairman of the Boettcher Foundation, symbolically presented the Boettcher Memorial Center to the City and County of Denver with Mayor Bill McNichols accepting. In all, the Boettcher Foundation had granted one and a half million dollars to Denver Botanic Gardens toward its goal to provide botanical education and enjoyment to the citizens of Denver and Colorado.



Mr. John Mitchell

Mayor William McNichols

Mr. Chris Dobbins

The Boettcher Foundation, conceived by Claude K. and nurtured financially by all members of the family, was formed in 1937 "to most effectively assist, encourage and promote the general well-being of mankind" in Colorado.

The lobby court with waterfall and pool surrounded by displays of ornamental plants provided an impressive entry to the Center.

Horticulture Hall, a combination lecture hall and exhibition room could accommodate more than 400 people. The adjacent plant preparation room with cool plant storage facilities was equally appealing to many plant societies. Shows and exhibits became annual events for Ikebana International, African Violet Council, Bonsai clubs, Gloxinia Gesneriad Growers, gladiolus, iris, orchid specialists, and rosarians.

Free public lectures on a variety of subjects were scheduled. Educational courses in botany, flower arranging, horticulture and related subjects were scheduled in the three new classrooms. An education specialist was appointed to the staff to direct a basic program. The Denver Public Schools offered summer botany classes for high school students, and the Community College of Denver scheduled a class in floral design. Numerous short courses were also announced. Heretofore the Education Committee, headed by Dr. Wayne Christian, had planned lectures and classes which were held at the House, in the South Room, or in the garage.

Now in its spacious surroundings the Helen Fowler Library could develop in size and diversity paralleling growth with our Gardens. The library had its beginnings almost 25 years earlier when Mrs. Fowler, a dedicated member of CF&HA donated her personal collection of 500 books to establish a horticultural library in Denver. She urged others to contribute books or money and by 1951 the library boasted more than 2,300 volumes for reference and loan. When Mrs. Fowler was no longer able to foster the library Mrs. Barbour came to its financial rescue and donated funds for new

acquisitions on a monthly basis. She and Patrick J. Gallavan provided handcrafted cases to store rare volumes at Botanic Gardens House. At the time the two organizations merged the library was the largest of its kind between St. Louis and the west coast.

Mary B. Hellriegel (Mrs. Arthur) was the first professional librarian to volunteer on a regular basis. She expanded the classification system according to the national standards of library practice. Lucy M. Crissey volunteered and was appointed chairman of the Library Committee. In 1965 she and other trained librarians offered to staff the library from 10 a.m. to 3 p.m. except Sundays.

In January, prior to dedication of the new Boettcher Memorial Center, Solange Gignac was named staff librarian. For many years Associates has provided a regular \$100 monthly donation and recently increased the amount to \$150. Through the used-books sale, sponsored by library volunteers, acquisitions have been given another boost. Presently the library contains over 6,300 books and 200 journals pertaining to botany, conservation, and plant-related subjects. A five-volume collection of water colors of Colorado wildflowers by Emma Armstrong Ervin is on permanent display here.

When plans for the Education Building were drawn Mrs. Waring provided funds for a rare book room to house a precious collection of classic herbals and other botanical works, all of which have been given by generous donors. Prized treasures include rare books of Dr. and Mrs. Waring, Mrs. Fowler, Mrs. Evans, Mrs. Kalmbach, Dr. Hildreth, Mr. and Mrs. Erl H. Ellis, Mrs. Crisp and others.

The Library Committee has six members plus 31 volunteers who staff the facility throughout the year. Miss Crissey is Honorary Librarian.

Located on the mezzanine of the Center is the Kathryn Kalmbach Herbarium. Mrs. Kalmbach, at George Kelly's suggestion, in 1941 began a study and collection of dried pressed plants, systematically named and arranged for ready reference. Mr. Pesman and other enthusiasts from CF&HA, Colorado Mountain Club, and Home Garden Club joined them in collecting specimens and mounting them. Currently collections are under way at Chatfield with Marjorie Shepherd overseeing the project and at the Reed Arboretum near Evergreen, a project of Around the Seasons Club led by Velma Richards (Mrs. H. R.).

Additions to the original herbarium have included the gift of the University of Denver herbarium and a number of smaller private collections such as a few plants from Alice Eastwood and other early collectors, Dr. J. J. Waring's allergy plant collection, Dr. H. Hartwell's collection of Colorado plants, Mrs. Crisp's collection of Denver trees and Colorado wildflowers; Dr. Helen Zeiner (Mrs. Fred) donated her grass collection. Presently more than 10,000 mounted specimens of native and cultivated plants are stored there.

The display area on the balcony is extremely popular during growing seasons, where visitors from nearby and out-of-state can learn the identity of plants both native and exotic. Fresh plant material is displayed weekly and the area is open 9 to 5 daily.

Dr. Zeiner accepted responsibility for the herbarium following Mrs. Kalmbach's death in 1962. She and her committee, all volunteers, staff the herbarium each Tuesday from 9 a.m. to 3 p.m. Dr. Zeiner is Honorary Curator.

With the opening of Boettcher Memorial Center the gift shop moved into its permanent jewel-box setting. A dream of the founders of Associates of Denver Botanic Gardens, the gift shop began in late 1964 in the foyer of Botanic Gardens House. A borrowed glass-enclosed display case housed the entire operation. Books and handcrafts were among the first offerings. Shortly after its beginning the Gift Shop Committee established a policy that merchandise must justifiably have a hint of nature.

Architects planned a gift shop near the entrance to the Conservatory where the shop first flowered on the dedication of the Conservatory. Within months the area was

too small. Once more the borrowed case was pressed into service and the second annual pre-Christmas sale was held in the south room. By 1968 the shop was thriving in new quarters, actually half of its present setting, with the annual sale held in the lobby as well.

Truly, "A gift *from* the Gardens is a gift *to* the Gardens," for over the years proceeds from the gift shop have made possible basic essentials such as a tractor, stake truck, audio-visual equipment. Landscaping around the Center has been possible and landscaping of the Hildreth Garden is nearing completion. Gifts have been made to the herbarium, the library, besides gifts of a greenhouse, a pergola and fountain. Most recent is \$5,000 to fund initial needs at Chatfield Arboretum.

These achievements have been made possible because management of the shop, staffing, planning, and purchasing, have all been the work of volunteers. Cathy Petersen (Mrs. Charles V.), Mary Secrest (Mrs. H. E.), Mrs. Morrison, and Mrs. Kosanke were named Honorary Life Members of Denver Botanic Gardens for their dedicated service. Charles Wilkins and Lucille Roberts (Mrs. Wm. N.) have rendered invaluable service as treasurer and assistant. In all, 51 volunteers serve regularly in the gift shop project. This number does not include those who devote limitless hours in craft workshops.



Mrs. James Waring

Mrs. E. R. Kalmbach

Mr. Lawrence Long

The mycological collection is the most specialized unit of botanical research at the Gardens. In 1967 Dr. D. H. Mitchel and Mary Hallock Wells moved their collections of native fungi species from the Denver Museum of Natural History to Botanic Gardens House. For a time it shared limited space with the herbarium there. Their laboratory equipment, the collection specimens, nearly 1700 color transparencies, technical books and other items have become valuable assets.

Not until the opening of the Education Building did these contributions to botanical science achieve proper status. It was then that the collection was moved to a research laboratory on the garden level of the Center. Meanwhile, Mrs. Wells and Dr. Mitchel organized the Colorado Mycological Society which meets at the Gardens. A book, *Mushroom Poisoning in Colorado*, has been published and distributed to emergency rooms of all hospitals in Colorado as well as 50 or 60 copies to hospitals in Kansas, Nebraska and Wyoming.

The collection currently is comprised of over 6,000 fungi from the Rocky Mountain region. All taxonomic studies have been made by volunteers. Dr. Mitchel is Honorary Curator of the Mycological collection.

The year 1971 sparked renewed activity in other areas of Denver Botanic Gardens as well. A Junior Membership was instituted for persons up to 16 years of age, primarily for those participating in the Children's Garden program. *The Jolly Green Gardener*, a bimonthly newsletter, with informative articles about plants and crafts was initiated. Beverly P. Nilsen, staff coordinator of the Children's Garden program, originated the publication. Eileen Bloustein (Mrs. Paul A.), artist and conservatory guide, soon volunteered to edit and illustrate this popular bulletin.

An Open Garden Day was scheduled in October 1971 so members and interested citizens might see the progress that had been made. For many months only workmen were allowed in the Gardens and the only concrete improvements in the massive upheaval were the seemingly endless walkways. Fortunately, the decorative waterways with their turbulent rushing waterfalls, calm streams, and interconnected ponds and lakes brought a myriad of responses from visitors. Work was under the supervision of Wright and McLaughlin.

Research on woody plants suitable for cultivation was made possible with construction of heated deep frames, cold frames, shade houses, and nursery beds. In 1972 more than 4,000 plants were produced by grafting, budding, layerage, hardwood cutting, softwood cutting, and seedage. Species and variety collections in this total include eight different cotoneasters, 23 flowering crabapples, 12 magnolias, viburnums, birches, maples, and even lilacs never before grown in North America.

Tempo for a full-scale arboretum was accelerated in March 1973 when Denver's City Council passed an ordinance authorizing Mayor Bill McNichols to sign a 25-year lease on some 750 acres of land at Chatfield Reservoir, Jefferson County, to be used for public park and recreation purposes. This land near the confluence of Deer Creek and the South Platte River is to be developed and maintained by Denver Botanic Gardens acting in accordance with plans approved by the Army Corps of Engineers.

This arboretum of native and introduced woody plants will promote ornamental horticulture in this area and enhance the beauty of gardens, parks and parkways along Colorado's Front Range. Two old farms and their buildings will be preserved as model historical farms and a turn-of-the-century one-room school house will be relocated and restored as a headquarters. The Hildebrand farm has been recognized as a national landmark for historical preservation. The *Green Thumb* Summer 1973 gives the Chatfield story.

The 1973 Plant Sale bore little resemblance to the modest beginning 25 years earlier when nurserymen and gardeners donated trees, shrubs, perennials, and services for auction to benefit CF&HA. As stated previously the auction was eliminated in 1964 and by 1969 the sale had expanded to 21 divisions with 318 volunteers. The sales area stretched from Botanic Gardens House to the Conservatory complex. Reconstruction of the out-door Gardens forced clustering the booths in and around Boettcher Memorial Center. During those years when the sale ballooned into the single most important benefit for the Gardens many served selflessly as coordinators or general chairmen: Elna Gibson (Mrs. Jess), Mrs. Honnen, Robin Bruhn (Mrs. Herb), Mrs. Morrison, Mrs. Washburne, and Gloria Falkenberg (Mrs. John). Some estimated attendance near 19,000 and the 356 enthusiastic but exhausted volunteers could only agree.

Two new greenhouses, dedicated in April 1974, more than doubled the capacity for growing plants under glass. Funds were provided by the late Dr. John C. Long and the Associates.

A donation of almost 17,000 bulbs representing 71 varieties of spring-flowering plants was received from the Netherlands Flower-Bulb Institute of New York. This

firm makes such contributions annually. Studies of 1973 plantings were published in *The Green Thumb*.

Additions have been made regularly to the All-America Rose Selection test garden. Plantings to existing collections included 57 new daylily varieties in the hemerocallis garden to bring that total to 350 varieties. Miniature dwarf bearded iris and Siberian iris were added. The Denver Dahlia Society established a new display garden with 275 plants. Peony and rose display gardens were other additions as well as 16 varieties of tropical water-lilies in the outdoor water garden. An All-America Gladiolus collection of 2700 corms was planted plus almost 10,000 annuals. Spruces, oaks, lilacs and other trees and shrubs enhanced the outdoor plantings while 142 varieties of orchids, 54 varieties of bromeliads and 200 miscellaneous varieties were added to the greenhouse and conservatory collections.

"Dr. Green" became chief diagnostician at the House Plant Clinic where twice weekly remedies are prescribed for plant ailments either at the office or by telephone. Members of the greenhouse and library staffs originated this popular idea.

More than 230,000 visitors passed through the turnstile during 1974 with hundreds attending such events as the annual plant sale, rose symposiums, gladiolus and bulb auctions, art exhibits, lectures, meetings, or as visitors on Greyline Tours.

Whether sniffing the refreshing fragrance of pineapple mint, quietly listening to the rattle of an earpod or concocting imaginative delicacies from lowly cocoa beans, children from 8 to 88 have found that a guided tour of the conservatory is undoubtedly the shortest distance between two points — mile high Denver and tropical jungles.

Since the guide program was initiated by Associates in January 1966, tours have been scheduled regularly by Denver and Jefferson county schools and by other public and private schools and colleges throughout Colorado and neighboring states. Convention guests, garden and civic clubs, youth and church organizations have been escorted by competent guides. In fact, before the energy crisis more than 18,000 persons were booked on 536 tours during a peak season.

Training guides and scheduling them for tours has become a complex volunteer program. By the end of the first year Mrs. Hayward was busily writing most of the first *Conservatory Plant Guide*, teaching some of the orientation classes, booking and guiding tours in cooperation with the Director and the Conservatory Superintendent. Dr. Zeiner was teaching basic botany and plant taxonomy. Soon Syd Glick (Mrs. H. S.) took over the scheduling of guides and the new education specialist booked tours.

About four years ago a nominal fee system was instituted for the eight-week training course. Under this program greater achievements have been possible. Two series of classes are given each year. About 50 volunteers serve regularly. Mrs. Hayward has been named an Honorary Life Member for her dedication.

The Children's Garden program was in its 16th year in 1975, and with food costs spiraling everywhere, the Gardens also participated in a number of projects for junior and senior citizens in other parts of the city. A project at Barrett School at 29th and Jackson Streets was a tribute to Dr. Hildreth, who strongly felt children should experience the pleasure of growing plants. Jerrie Layden (Mrs. James), one of the first volunteer instructors under Chairman John Durrance, soon became chairman of the Children's Garden Committee, a post she has retained. About 35 adults volunteer here while 15 volunteer at Barrett.

General classes scheduled by Education Specialist Margaret Sikes have grown to nearly 50. Enrollment totals approximately 1500. Many classes are free, others have a modest fee.

For the past decade wildflower field trips, led by Dr. Brunquist of the Denver Museum of Natural History, have been twice monthly adventures. Naturalists, either

newcomers or natives, have shared delightful experiences in ecology, plant evolution and nature photography.

This Silver Anniversary story of Denver Botanic Gardens is actually a collection of many histories, all integral segments of the whole – the story of Denver Botanic Gardens. Much was told in the first yellowed pages of *The Green Thumb*, Vol. I No. 1, February 1944 and continued to be revealed in the 32 volumes published since: first as the voice of CF&HA, later as a record of progress of the Denver Botanic Gardens. Since November 1960 *The Green Thumb* has been the official publication of Denver Botanic Gardens.

Mr. Kelly served both the magazine and CF&HA their first dozen years. At his request in 1954 an editorial committee was formed to assist in obtaining contributions: topics, authors and artists. The magazine, conceived as an educational agency in promoting horticulture in this region, has signified continuity between both organizations.

With Mr. Pesman as first chairman, the Green Thumb Editorial Committee has functioned with varying degrees of responsibility and has, in effect, been the stabilizing factor in the life of the magazine. Its members have accepted the obligation that the magazine must go to press, with or without an editor. In fact, for some, this silver anniversary is their silver anniversary as volunteers.

Here in Colorado where horticulture IS different the magazine has been an effective educational device. Most of the material in Mr. Kelly's first book, *Rocky Mountain Horticulture Is Different*, had been written by him for the magazine.

Valuable horticultural and historical information has been dispensed through *The Green Thumb*. A survey of lilacs successful in this area appeared in an early issue. Recommendations for growing fruit and vegetables, best evergreens, plant hardiness charts, insect controls, native plants for cultivation – an endless array of cultural information has been preserved. Special issues were devoted to iris conventions in 1963 and 1967; the American Rose Society was spotlighted; cacti, gesneriads, bromeliads, and many other specialized plant groups have been featured.

What Tree Is This? by Mrs. Barbour and Earl Sinnamon, with drawings by Mr. Pesman, was the first booklet published by Denver Botanic Gardens. Originally this simple key for tree identification was published by the City Forestry Department. Mrs. Barbour financed the booklet with proceeds designated for the library.

The first *Conservatory Plant Guide* was published as an issue of *The Green Thumb* in 1966. Offered for sale as a self-guiding tour it was revised in 1967. In 1971 an entirely new *Conservatory Plant Guide* was published with Mrs. Hayward, editor, and her husband Phil responsible for graphic design. Dr. Hildreth, Dr. Zeiner and Bernice "Pete" Petersen (Mrs. J. V.) were assistants.

Meet the Natives, by Mr. Pesman, published in cooperation with the Denver Museum of Natural History in 1942, became a publication of Denver Botanic Gardens in 1968. Revisions of the seventh edition were made by Drs. Hildreth, Zeiner and Shubert. The 1975 printing was the responsibility of the editorial committee.

Plans, Parks and People, a tribute to S. R. DeBoer, was published in 1972. Mrs. Novitt spent countless months interviewing Mr. DeBoer and transcribing the material. Wes Woodward put the story together – 80 pages of history within a single cover.

The story behind the Chatfield Arboretum Site was revealed in Summer 1973 *Green Thumb*. Again Mr. Woodward was the historian.

Since 1972 the Denver Botanic Gardens Annual Report has been separated from the magazine but remains the responsibility of the editor.

After Mr. Oppe's departure in 1965 the *Green Thumb Newsletter* became the province of the Editorial Committee. For 50 issues, including a special Storm Issue in 1969, William H. Lucking and Mrs. "Pete" Petersen prepared the Garden Tips. Since

1970 Dr. James Feucht has contributed this valuable horticultural information. Miss Margaret Sikes, education specialist, has been the editor from 1972 on.

Artists have been equally important as authors for the publications of Denver Botanic Gardens. Often their contributions combine both talents. *Fun with Gourds*, written and illustrated by Pauline Roberts Steele, appeared in 1952. Her scientifically accurate drawings as well as her lively cartoons have given dozens of issues the right touch. Phil Hayward, a professional artist, has modestly provided covers and illustrations as a volunteer. His first cover appeared in 1950 and since 1967 his artistic drawings, scientific in detail, have illustrated articles written by his wife, Peg. Other regular artists include Mrs. Suzanne Ash, Mrs. Bloustein and Dr. Janet Wingate (Mrs. Hugh).

Tying all these issues of *The Green Thumb* into a neat system of topics and authors, readily available for careful study, has been the work of additional volunteers. An 11-year index of the magazine was published in 1954 with an index appearing annually thereafter. In 1969, on the 25th anniversary of the magazine, Miss Crissey, Mrs. Ash and Mrs. Nilsen volunteered to prepare a 25-year index. Library volunteers have willingly kept the index current, a valuable addition to the many services available in the Helen Fowler Library.

Assuredly these articles in *The Green Thumb* have been vital sources for this chronicle published on the Silver Anniversary of Denver Botanic Gardens.

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Dr. William G. Gambill, Jr.
Dr. Siebert

Dr. A. C. Hildreth
Mr. John C. Mitchell

DENVER BOTANIC GARDENS, INC.
909 York Street
Denver, Colorado

FINANCIAL STATEMENT
December 31, 1975

ASSETS

Current Assets:

Checking Account	6,658	
Savings Accounts	100,012	
Investment Trust Account	101,630	
Commercial Paper	100,000	
Tax Reserve, Etc.	<u>1,446</u>	309,746

Other Assets:

Conservatory	882,894	
Education Building	861,454	
Greenhouses	159,001	
Other Real Estate	366,685	
Master Plan Development	821,938	
Equipment Owned	<u>19,775</u>	<u>3,111,747</u>

TOTAL		<u><u>3,421,493</u></u>
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EQUITY ACCOUNTS

Liabilities:

Notes Payable	59,751	
Rent Deposits	<u>600</u>	60,351

Fund Accounts:

Represented by Current Assets	309,746	
Represented by Other Assets	<u>3,051,396</u>	<u>3,361,142</u>

TOTAL		<u><u>3,421,493</u></u>
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Accountant's Opinion

I have examined the balance sheet of the Denver Botanic Gardens, Inc. as of December 31, 1975. The examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as were considered necessary in the circumstances.

In my opinion, the accompanying balance sheet presents fairly the financial position of the Denver Botanic Gardens, Inc. at December 31, 1975.

J. D. Vander Ploeg
Certified Public Accountant

MEMORIAL GIFTS

Memorial contributions have been received during 1975
for the following persons whose names have been
inscribed in the Denver Botanic Gardens *Book of Memories*.

Mr. Cyrus Allen
Annie Birkenmayer
Esther Brunquist
Frieda Calhoun
Mr. Brown Cannon
Mrs. Adolph Coors III
Mr. Frederick E. Dickerson
Mr. George Fukuma
Mr. Lawrence Hackstaff
Dr. A. C. Hildreth
Mary E. Jacobson

Mr. Ivan B. Kline
Mr. Ralph Mayo, Sr.
Margaret McLister
Mr. John G. McMurtry
Mr. Charles Ransom
Mr. Ralph Sargeant, Jr.
Mr. Roland Sheldon
Lucy Steinhaver
Mrs. Glen H. Stephens
Mrs. Charles Wangnild
Mr. Britton White



Admiring the Conservatory

THE VOLUNTEERS

Their organizations and committees.

ASSOCIATES OF DENVER BOTANIC GARDENS

Mrs. H. S. Glick	<i>President, 1975-1976</i>
Mrs. L. A. Waterman, Jr.	<i>Conservatory Guides</i>
	<i>Scheduling Chairman, 1974-1975</i>
Mrs. R. W. Hanselman	<i>Conservatory Guides</i>
	<i>Scheduling Chairman, 1975-1976</i>
Mrs. Mary Secrest	<i>Gift Shop Committee Chairman</i>
Mrs. Wm. M. Falion, III	<i>Hostess and Information Chairman 1974-1975</i>
Mrs. James C. Syner	<i>Hostess and Information Chairman 1975-1976</i>
Mrs. William B. Collister	<i>Training Program Chairman, 1974-1976</i>

AROUND THE SEASONS CLUB

Mrs. Doris Evans	<i>President, 1974-1975</i>
Mrs. D. L. Christenson	<i>President, 1975-1976</i>

DENVER BOTANIC GARDENS GUILD

Mrs. C. J. Nicoulin	<i>President, 1974-1975</i>
Mrs. T. W. Wrenn, Jr.	<i>President, 1975-1976</i>
Mrs. Loring Brock	<i>Terrace & Garden Tour Chairman, 1976</i>

GARDEN CLUB OF DENVER

Mrs. Richard A. Kirk	<i>President, 1974-1976</i>
--------------------------------	-----------------------------



Volunteers



Volunteers

**DENVER BOTANIC GARDENS
STANDING COMMITTEES
1975**

CHATFIELD COMMITTEE

Mr. Edward P. Connors, Chairman
Mr. John Bermingham
Mr. Herbert I. Jones
Mr. Harry B. Kuesel
Dr. Moras L. Shubert
Mr. Con Tolman

Miss Exie White
Mr. Rudy Woodruff
Mr. Glenn Park, Ex-Officio
Dr. William G. Gambill, Jr., Ex-Officio
Mr. John C. Mitchell, Ex-Officio

Children's Garden Committee

Mrs. James Layden, Chairman
Mrs. Julia Andrews-Jones
Dr. John R. Durrance
Mr. Richard Hannigan
Mrs. Lorena Seney

Mrs. James Thompson
Mrs. Irene Vittetoe
Mrs. James J. Waring
Beverly Nilsen, Ex-Officio

Children's Garden Extension

Mr. Harry B. Kuesel, Chairman
Mr. Anthony J. Makowski, Principal,
Barrett Elementary School
Mr. Orville K. Jacobs, Barrett
Elementary School

Parent Representative from Park Hill
District, to be selected
Beverly Nilsen, Ex-Officio
Mr. Glenn Park, Ex-Officio
Dr. William G. Gambill, Jr., Ex-Officio

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Mrs. John Brooks, Jr., Chairman
Mrs. Walter B. Ash
Mrs. Donald C. Campbell
Mr. George M. Canon
Mrs. John F. Falkenberg
Mrs. Richard W. Hanselman
Mrs. Richard A. Kirk

Mr. Alexander L. Kirkpatrick
Mrs. Norman F. Patrick
Mrs. J. V. Petersen
Mrs. Howard Rea
Mrs. William Stanley
Mr. Glenn Park, Ex-Officio
Dr. William G. Gambill, Jr., Ex-Officio

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Mrs. Walter B. Ash
Mrs. Paul A. Bloustein
Mrs. William H. Crisp
Mrs. George H. Garrey
Mrs. Phil Hayward
Mrs. Robert M. Kosanke

Dr. Moras L. Shubert
Mrs. J. P. Steele, Jr.
Dr. Hugh Wingate
Dr. Janet C. Wingate
Dr. Helen M. Zeiner
Dr. William G. Gambill, Jr., Ex-Officio
Miss Margaret Sikes, Ex-Officio
Ms. Solange Huggins, Ex-Officio

Education Committee

Dr. Moras L. Shubert, Chairman
(Univ. of Denver)

Dr. James R. Feucht (C.S.U.
Horticultural Extension Service)

Mrs. Phil Hayward

Mr. Kenneth J. Mills (Denver
Public Schools)

Mr. James O'Shea (Community College of
Denver, North Campus)

Mrs. William A. Steele (Metropolitan
State College)

Mr. James Trammel (Arapahoe Community
College)

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Mr. Lawrence A. Long

Mr. John C. Mitchell

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Mrs. Page Edwards

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Mrs. Marjorie Shepherd

Dr. Janet C. Wingate

Mrs. Leslie P. Witte

Mrs. F. Richard Yeatts

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Dr. John R. Durrance

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Mrs. Willett S. Moore

Mr. Chris G. Moritz

Mrs. Jane Silverstein Ries

Dr. Moras L. Shubert

Mr. Harry Swift

Mr. Larry Watson

Beverly Nilsen, Ex-Officio

Glenn Park, Ex-Officio

Dr. William G. Gambill, Jr., Ex-Officio

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Mrs. George M. Canon

Mrs. E. H. Honnen

Mrs. George H. Garrey

Mrs. Richard A. Kirk

Mrs. James J. Waring

Miss Ruth Hawkins, Ex-Officio

Dr. William G. Gambill, Jr., Ex-Officio

Library Committee

Miss Rachael Hauck, Chairman

Miss Lucy M. Crissey

Miss Geneva Eldridge

Mrs. John F. Falkenberg

Mrs. Bruce Jackson

Ms. Peg Milroy

Mr. Henry J. Shearouse

Mrs. James White

Ms. Solange Huggins, Ex-Officio

Dr. William G. Gambill, Jr., Ex-Officio

Lobby Court Committee

Mrs. Donald C. Campbell, Chairman
Mr. George M. Canon
Mrs. Frank B. Freyer, II

Mrs. Willett S. Moore
Mr. O. Ben Haley, Jr.

Nominating Committee

Mr. Richard A. Kirk, Chairman
Mr. Charles C. Nicola
Mr. James C. Owen, Jr.

Mrs. Theodore B. Washburne
Mr. John C. Mitchell, Ex-Officio

Planning Committee

Mr. Harley G. Higbie, Jr., Chairman
Mr. Edward P. Connors
Dr. John R. Durrance
Mr. John C. Mitchell

Mr. James C. Owen, Jr.
Mrs. James J. Waring
Dr. William G. Gambill, Jr., Ex-Officio

Plant Sale Committee

Mrs. John F. Falkenberg, Chairman
Mr. Edward P. Connors
Mrs. Phil Hayward
Mrs. William C. Jackson, Jr.
Mrs. Graham B. Morrison

Mrs. Norman F. Patrick
Mrs. Henry W. Toll, Jr.
Mrs. Theodore B. Washburne
Ex-Officio Members:
Annual Plant Sale Co-Chairmen



Mrs. George H. Garrey

Dr. Robert Stearns



Horticulture House, 1958

PHOTOGRAPHS

Front and Back Covers, Pages 1, 2, 6, 8, 9 — Bill Anderson

Page 11 — Jack Fason

Pages 13, 16, 21, 24, 25, 28, 30, 34,

36, 37, 40, Inside Back Cover,

Green Thumb file photos

Page 19, courtesy Mrs. Frank B. Freyer II



ANNUAL REPORT

DENVER BOTANIC GARDENS

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DENVER, COLORADO 80206

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